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# FOREWORD

DECLINING agricultural income in the face of rising industrial income presents one of our gravest national problems. The factors that are and have been at work to increase urban prosperity while decreasing rural prosperity relative to each other are numerous and complicated. No one solution will meet all the situations thus created, least of all the proposal to do nothing about it.

Part I presents some of the facts—not new but none the less important. Farm incomes (p. 1) are recovering slowly from the sharp depression of 1919–21, but they are still below the purchasing power of other groups. Our farmers are receiving a diminishing share of our national income (p. 7). Some farm products have suffered more than others (p. 16). Tenancy is increasing and the equities of farmer owners has been decreasing (p. 20). Since 1920 farm land values have declined more rapidly (p. 27) than have farm incomes. The actual farm population has declined to about 88 per cent of what it was in 1920 (p. 51). At the same time the former rate of increase in urban populations ceases to continue (p. 44) so that despite the trek to the city the farmer has not the usual rate of population increase to sell to. Agricultural land values are flowing back into certain urban areas (p. 58) but vast acreages are still being abandoned, acreages peculiarly suited in no small part to reforestation (p. 70).

Some causes of such an agricultural depression are discussed in Part II. We still export a considerable portion of our agricultural output (p. 77) nor are our agricultural exports tending to decrease (p. 80). Save in a few of our farm products such as milk our farm production exceeds domestic consumption and hence the tariff cannot aid the price of products exported, to the handicap of the American farmer (p. 89). Agricultural production has increased (p. 97) as farm incomes and land values have decreased; the farmer has tried to meet his situation by adopting every practical means of scientific production. Transportation rate increases (p. 147) have helped push farm net incomes downward in certain sections of the country. Immigration (p. 151) piled cheap labor onto our farms to a point where further immigrants should not be sent into rural regions with its precarious subsistence. Part of our present agricultural situation is no doubt due to the ruthless deflation of 1919 and to the fact that urban incomes have not declined as have farm incomes. Stabilization of prices will help the farmer, but of far greater importance to the farmer than changes in the general price level (p. 158) are fluctuations in the prices of the particular commodity he produces. Erosion costs (p. 170) are mounting. The land under irrigation in this country is but 4 per cent of the total area of improved lands and the area under Federal irrigation constitutes but 6.5 per cent of the entire area under irrigation (p. 177). Such investments in the face of over production have been helpful only to the localities and are of doubtful value because of the costs even in some of these. Certainly no further development of this kind should be undertaken at least until agriculture is better off relative to industry (p. 186). Higher farm labor costs are being met by increasing labor efficiency (p. 196).

Turning now (Part III) to some economic remedies President Farrell (p. 202) presents the picture of what

science has done for the farmer. It is the paradox of scientific production that it has increased output in the face of declining net returns. The individual farmer has had no other way out. The way out is not less of science in farming but more. Much can be done in the way of balancing our agricultural output to market demands and to net returns (p. 210).. Diversification of agricultural production (p. 216) may offer help to individual farmers as may specialization, but as a way out for a national policy it offers little. As compared with other farm products livestock values have recently been upward (p. 222). Industrialization of agriculture (p. 228) and making the most of the science of farm management (p. 235) offer suggestive opportunities.. The dairy industry (p. 245) has prospered under efficiency and a domestic market, but even here production increases at a rate that will soon equal domestic demand. The Agriculture Extension service (p. 250) has done yeoman service in bringing home to every farmer the advantages of the best in farm practice. Commercial fertilizers, properly and adequately used, have economic significance (p. 257) and certain industrial uses open advantageously for some farm products (p. 266). A permanent farm policy will reckon not only with production and consumption trends in this country but also trends in production abroad (p. 271). The Mississippi Waterway (p. 283) and the St. Lawrence Waterway (p. 291) offer transportation avenues for the development of our great inland empire. The relocation of industries (p. 296) offer opportunities for local markets sans long freight hauls. Crop insurance (p. 302) is worthy of consideration as a means of underwriting the risks of weather. Our agricultural heritage placed natural emphasis on the general property tax as a source of revenue. But declining agricultural and rising urban incomes point to the necessity of a corresponding readjustment in the tax burden (p. 312).

We conclude (Part IV) with a discussion of some marketing remedies. Senator Capper cogently reviews (p. 318) some essentials of farm relief, and the President of the American Farm Bureau presents those essentials as viewed by that organization (p. 322). The attitude of the National Grange toward the tariff is presented by its National Master (p. 329). The advantages and limitations of direct marketing are considered (p. 334) as are the substantial contributions to wise marketing that can be made only by adequate market information (p. 341). Our Foreign Policies (p. 352) can help to contribute to both our buying and selling power abroad. The Farm Relief Plans of Czechoslovakia (p. 358) and of Germany (p. 361) offer suggestions as to what we may expect in the farm policies of other countries. Foreign National Policies are then reviewed (p. 367) and the plans for raising the prices of farm products are presented (p. 380). As the farm surplus problem has had major attention in recent proposals before Congress, the article on the relation of annual weather surpluses to net farm incomes (p. 391) is most opportune. The succeeding article (p. 402) cogently discusses the stabilization of farm prices and the McNary-Haugen Bill.

Presidents Harding and Coolidge have emphasized the part that coöperative marketing can play in our national farm policy. Coöperation does offer the means of adapting production to market needs. The factors in the development of coöperative marketing (p. 406) and recent trends in coöperative marketing (p. 414) are presented. A specialist discusses what has and what can be done by standardization

(p. 419) and one long versed in both the practice and technique of coöperative marketing tells what coöperatives can do (p. 425). The proposal for a Federal Farm Board offers a special basis for a permanent agricultural policy formulated by market demands on the one hand, and production on the other (p. 439). Senator McNary reviews his Farm Board Relief Bill (p. 448) and in conclusion Secretary Jardine (p. 450) emphasizes the importance of Surplus Control.

In January, 1925, the Academy presented a volume on The Agricultural Situation. This present volume, a companion volume, is sent out in the hope that it may offer constructive guidance to the solution of a grave national problem.

CLYDE L. KING,
*Editor.*

# Recent Trends in Real Farm Income

By L. H. Bean
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EACH of the several ways of measuring the recent trends in farm income during the past ten years leads to the same general conclusions, namely: (1) that the sharp decline from 1919 to 1921 was followed by a marked recovery from 1921 to 1925 and by a fairly stable income level between 1925 and 1928; (2) that average incomes in the past four years have not been as high as in the prosperous year 1919-20 before the great price depression; and (3) that the recovery in farm income has not kept pace with the trend in incomes of other groups which in the past four years have exceeded the prosperous incomes of 1919–20.

These conclusions may be derived from a review of changes in farm income either in terms of rates of return on capital used in farm production, or in terms of rewards for labor employed, or in terms of the buying power of money income in exchange for goods usually bought by farmers. It is the purpose of this paper first to review briefly the trends in farm income as reflected in the rates of return on capital and the rewards for labor as shown by the yearly published estimates of the Department of Agriculture, and then to indicate the recent trends in buying power of the farmers' money income, which we shall refer to as "real" income.

It may be pointed out at the outset that the several methods of measuring income trends imply different conceptions of agriculture as an industry. If the agricultural industry is conceived as one in which large portions of national capital and labor are employed to produce adequate returns, the significant measures of changes in farm income are the rate of return on the capital employed, and the rewards for labor expended. If, on the other hand, agriculture is considered as an industry in which farm products are produced primarily to be exchanged for the goods and services of other groups, the significant measure of changes in farm income is the purchasing power of the farmers' money returns, that is, the amount of goods and services at current prices paid by farmers for which a given year's cash income can be exchanged.

## Trends in the Rate Earned on Capital and in the Reward for Labor

The recent trends in the rate of return on capital and labor, are shown in the following table of data taken from the annual estimates of the United States Department of Agriculture.

In the first year for which official estimates are available, the gross income from agricultural production exceeded the expenses of production and a wage allowance for the labor of the farmer and his family, the difference being sufficient to yield an average return for all capital and management of about 6 per cent on the current value of capital employed in farm production. The great declines in gross income of the next two seasons which came with the post-war price depression were not accompanied by a proportionate reduction in production expenses. Consequently, returns on capital were

TABLE I—FARM INCOME: (1) RATES OF RETURN ON CAPITAL AND (2) REWARD FOR LABOR *

| Year | Rate Earned on | | Reward for Labor and Management per Farm Family |
|---|---|---|---|
| | All Capital Employed in Agriculture, Including Management | Operator's Net Capital Investment, Including Management | |
| | Per Cent | Per Cent | Dollars |
| 1919–20 | 6.3 | 5.7 | 917 |
| 1920–21 | .5 | −4.2 | 397 |
| 1921–22 | 1.2 | −2.3 | 270 |
| 1922–23 | 3.2 | 1.2 | 440 |
| 1923–24 | 3.5 | 1.6 | 533 |
| 1924–25 | 4.4 | 3.2 | 624 |
| 1925–26 | 5.2 | 4.3 | 690 |
| 1926–27 | 4.3 | 2.9 | 636 |
| 1127–28 | 4.6 | 3.4 | 657 |

* *Crops and Markets*, July 1928.

practically wiped out in 1920-21 and nearly so in 1921–22. With price improvement since then the return on capital has increased to somewhat over 5 per cent in 1925, and has averaged somewhat less than that in 1926–27 and 1927–28. Similarly, the return on the operator's own net capital investment, after paying to non-farmers more than six per cent interest on borrowed capital and rent on rented farms, fell sharply in 1920–21 and 1921–22 as a result of the much greater decline in gross income than in expenses of production. The recent recovery restored these earnings on operator-capital to over 4 per cent in 1925–26 compared with nearly 6 per cent in 1919–20 and to somewhat lower rates in 1926–27 and 1927-28.

Measured in terms of reward per farm for labor and management, trends in farm income similar to those shown by the rates on capital are evident. In 1919–20, gross income available for the average farmers' own labor and that of his family, after deducting operating expenses and a 4.5 per cent allowance for capital, amounted to $917, declined abruptly to under $300 by 1921–22, recovered to nearly $700 in 1925–26, and has remained below that figure during the next two years. Judging from the production and price prospects of the current season, 1928–29 it appears that returns are not likely to be much different from those of the past year, indicating that the trend in farm income during the past four seasons has been fairly stable compared with the marked decline of 1919–21 and the marked advance from 1921 to 1925.

### TRENDS IN REAL FARM INCOME

To measure the recent trends in *real income*, it is necessary to compare the money income from farm production with the prices of goods and services for which these money returns are exchanged.

From the official income estimates, it is possible to obtain: (1) the yearly cash income available for all purposes; (2) cash income available for production and living expenses other than taxes, rent, interest, and wages paid to non-operators; and (3) cash income available for living expenses only. From the published indexes of prices

paid by farmers for goods bought, there are available separate indexes of prices paid for goods used in production and for goods used in the farm home, as well as a combined index of these two groups. These two groups combined, it is to be observed, correspond to the prices of goods for which the second classification of cash income, shown above, is usually spent and the index of prices paid for goods used in the farm home corresponds to the cash income available for living expenses. These two series of cash income estimates and their corresponding price indexes are shown in Table II.

The price indexes are intended to show the variations in the cost to farmers of quantities of certain goods bought by them in a selected period. Thus the quantity of goods used in farm production and in the farm home in the period 1919–24 cost 105 per cent more in 1919 than they would have cost in 1910–14 (shown here by an index of 205 compared with 100 in the pre-war period). By 1921 the decline in prices paid by farmers reduced this index to 156. In other words, the cost of that quantity and combination of goods declined about 25 per cent from 1919 to 1921, and it has remained not far from the 1921 level since then.

Cash incomes, on the other hand,

TABLE II—CASH FARM INCOME, INDEXES OF PRICES PAID BY FARMERS, AND THE PURCHASING POWER OF CASH FARM INCOME AND OF FACTORY WAGES

| Year | Cash Income per Farm Available for* | | Indexes of Prices Paid by Farmers for‡ | | Relative Purchasing Power of | | |
|---|---|---|---|---|---|---|---|
| | Production and Living Expenses† | Living Expenses | Production and Living Expenses | Living Expenses | Cash Farm Income for Production and Living Expenses§ | Cash Farm Income for Living Expenses‖ | Factory Wages per Person Available for Employment¶ |
| | Dollars | Dollars | Per Cent | Per Cent | Per Cent | Per Cent | Per Cent |
| 1919–20 | 1,311 | 798 | 205 | 214 | 100 | 100 | 100 |
| 1920–21 | 847 | 274 | 206 | 227 | 64 | 32 | 96 |
| 1921–22 | 565 | 184 | 156 | 165 | 57 | 30 | 84 |
| 1922–23 | 734 | 343 | 152 | 160 | 76 | 57 | 116 |
| 1923–24 | 828 | 396 | 153 | 161 | 84 | 66 | 119 |
| 1924–25 | 939 | 489 | 154 | 162 | 95 | 81 | 117 |
| 1925–26 | 1,002 | 525 | 159 | 165 | 97 | 85 | 117 |
| 1926–27 | 923 | 453 | 156 | 165 | 92 | 74 | 119 |
| 1927–28 | 970 | 502 | 154 | 161 | 98 | 84 | 121 |

* Derived from estimates published in *Crops and Markets*, July, 1928.

† After taxes, rent interest, and wages paid to non-operators.

‡ 1910–14=100, calendar year averages, 1919–27 inclusive. See *Agricultural Situation*, December 1, 1928.

§ Column 1, divided by column 3, and result expressed as per cent of the 1919 quotient.

‖ Column 2 divided by column 4, and result expressed as per cent of the 1919 quotient.

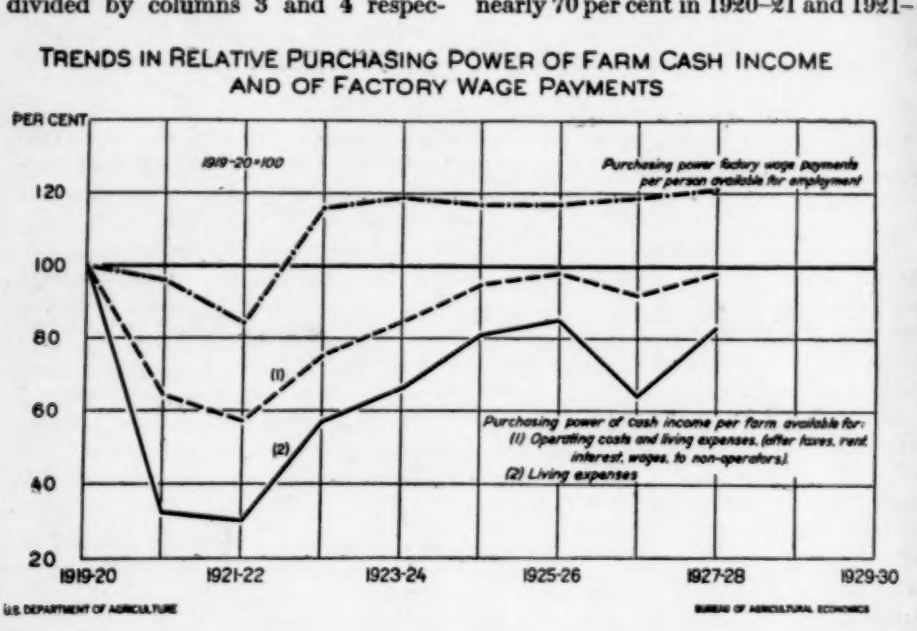
¶ Derived as follows: From census data and indexes of the Federal Reserve Board estimates were made of crop-year total wage payrolls of all manufacturing establishments. These estimates were then adjusted for the shift of factory workers to other occupations (about one per cent per year) and for the changes in cost of living as shown by the Bureau of Labor Statistics for December of each year.

declined much more by 1921, but they have also made a considerable recovery. By comparing these cash income estimates with the prices of the corresponding commodities for which the incomes were spent, we may obtain an indication of the trend in the real farm income, that is, the relative volume of a given combination of goods which the given cash incomes could purchase at the prices charged farmers in each of the years 1919–27. In order to facilitate comparison, the cash incomes in Table II, in columns 1 and 2, may be divided by columns 3 and 4 respectively, and the result expressed as percentages of their respective averages for the period 1919–27, or for any one year of this period. The final result in percentages indicates the amount by which the purchasing power of cash incomes, or the volume of the same combination of goods that the cash income could buy exceeded or fell short of that in the period or year chosen for comparison. (See Chart I.) In chart I the purchasing power of 1919–20 is used as the basis for comparing the trends subsequent to that year.

Taking the average buying power of cash income in 1919–20 as a base of comparison only (and not as a measure of "normal" buying power) it is found that the real income available for both operating costs and living expenses declined about 40 per cent in 1920–21 and 1921–22, recovered nearly to the 1919 level by 1925–26, and has since then remained near the 1925–26 level.

Real income available for living expenses, on the other hand, declined nearly 70 per cent in 1920–21 and 1921–22, recovered to approximately 85 per cent of the 1919–20 buying power, and has remained somewhat below the 1925 level, or approximately 20 per cent below the 1919–20 level. The greater decline in the purchasing power of income available for living expenses than in income available for both production and living expenses between 1919 and 1921 and the greater advance in income for living expenses since 1921 reflect the fact that production ex-

TRENDS IN RELATIVE PURCHASING POWER OF FARM CASH INCOME AND OF FACTORY WAGE PAYMENTS



penses did not decline as much as did gross cash income, and that the relatively high proportion of fixed production costs tends to create greater variations in the real income available for living expenses than in the income available for all purposes combined. Consequently in years of declining farm incomes the farmers' standard of living suffers relatively more than is indicated by the decline in gross cash income and in years of rising incomes, the farmers' standard of living improves more. The fact that larger portions of gross income are now required for fixed charges and operating costs than in 1919 is shown by the relatively lower level of the buying power of farm income available for living expenses.

## TREND IN REAL INCOME OF FACTORY WAGE EMPLOYEES

For a proper interpretation of the recent trends in real farm income at least two additional important comparisons are necessary. (a) In order to determine whether the real incomes of the past few years are above or below "normal" it is necessary to know the trend in real incomes prior to 1919. In view of the great yearly changes since 1919, the incomes of any one year, or that for any period of years can hardly be called "normal" without reference to the trend in real incomes prior to the abnormal wartime and post-war conditions. Unfortunately the lack of comparable data prior to 1919 makes impossible any conclusion as to the "normalcy" of the recent levels of real farm income. (b) In order to determine the adequacy of the recent levels of farm income they need to be compared with the trends in real incomes of other groups. If in a given period, the real incomes of other groups decline and those of farmers decline less, the latter are in a relatively better position, and if the real incomes of other groups advance and incomes of farmers advance less, the latter are in a relatively worse position. In the first case their standards of living have not been curtailed as much as those of others, while in the second case their standards of living have failed to keep pace. In order to throw some light on the second of these additional comparisons, there has been included in the accompanying chart the real incomes of factory wage employees who, together with those dependent on their earnings, constitute approximately as large a portion of our national population as do the farm operators and their families.

The real incomes, or relative purchasing power of factory wage employees, shown here, were derived from data on payrolls and employment published by the Bureau of the Census, and by the Federal Reserve Board. Estimates were first made of the total wage payments by all manufacturing establishments, and then adjusted for the gradual shift of factory workers to other occupations, which appears to have taken place at the rate of about 1 per cent a year. These adjusted estimates of factory payrolls available for all factory workers were finally divided by the Bureau of Labor Statistics index of cost of living, and expressed as percentages, with 1919–20 as 100. The results are shown in the accompanying chart.[1]

The greatest changes in the relative purchasing power of factory workers occurred in 1921-22 and in 1922–23. In 1921–22, their purchasing power was reduced nearly 20% below that of 1919–20, largely as a result of unemployment. The purchasing power per

[1] Inasmuch as the Bureau of Labor Statistics index of cost of living does not include prices of automobiles, which, if included, would tend to lower the index, the rise in real factory wages shown in the chart is probably understated.

person employed did not show any material change. Since 1922, their purchasing power has been rather stable, showing a slight upward trend. The level of purchasing power of about 20 per cent above the comparable figure for 1919–20 during the past three years is the result of total factory payrolls about 5–7 per cent higher than in 1919–20, the number of workers associated with manufacturing establishments about 6–8 per cent less, and the cost of living about 11–14 per cent less than in 1919–20.

Significant differences are obvious in the trends of these two major economic groups. The post-war depression affected the buying power of farmers much more than that of industrial employees. The latter have shared in the general industrial prosperity of the country since the industrial recovery of 1922, and their purchasing power now exceeds by about 20 per cent their purchasing power in the year of 1919–20. On the other hand, the purchasing power of the farmers' income available for living expenses, although considerably improved since the post-war depression, is now about 20 per cent less than that of the prosperous year 1919–20.

# The Farm Income Problem

By R. J. McFall
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THE question of farm income is one of the great problems facing the country today. Affecting directly, as it does, the well-being of an important part of the national population, it is a question of profound economic significance. It was one of the keynotes in what has been one of the most interesting political campaigns in the nation's history. And, while some say that the verdict of the election shows that farm distress is not so real with the farmers as with certain politicians, nevertheless, the leaders of the party returned to power are planning to proceed upon the understanding that distress is real and must be relieved.

The real facts in the farm income situation affect the economic condition not only of our farmers but also of those whose greatest economic prosperity depends upon the healthy buying power of the farmers—and that is practically the entire nation. Upon a thorough analysis of the farm income situation should be based the conclusion as to whether or not farm relief is needed, and, if so, whether the proposals for its accomplishment are adequate to attack the problem at its root and to supply real and lasting relief. It may easily be, if the farm distress is as great as often claimed, that the proposals for its relief are too lightly considered and not sufficiently radical or far-reaching. In any case the best economic and political interests of the nation would be furthered if the full facts of the situation could be freed from partisanship and made known to the public in a judicial manner, and then the nation could in the light of these facts adopt a radically constructive long-time policy for agriculture. So much recent discussion of this problem, involving proposed solutions, has been based upon only part of the facts of recent short-time changes. There are long-time trends which must be faced as well as a wide range of recent developments in order to afford a solution worthy of the problem and those involved in it.

With the space and facilities at our disposal it will be impossible to make an exhaustive study of this question. However, by means of building upon the far-reaching researches of the Department of Agriculture, we shall attempt to present some of the most salient facts in the situation.

Four years ago, in the pages of *The Annals*,[1] the author pointed out that there were various important viewpoints of the economic well-being of the farming business which must be considered more or less separately. This thesis has come to be more widely accepted since that time, and perhaps less dependence has come to be placed upon the superficial indications of price movements.

It is now freely accepted by marketing specialists and advertising men that the total farm income of the nation, and of each of its sub-divided communities, is a matter of primary importance to those who would sell goods to the farmers. Fortunes have been made these last few years by those holding stocks of mail-order houses and concerns making agricultural machinery for the farmers, and that because the total farm income allowed heavy pur-

[1] R. M. McFall, "*The Farm Income Situation*," *The Annals*, January, 1925; pp. 1–21.

chases from these establishments. Moreover, wholesale distributors attempt to push their sales of goods appealing to farmers mainly in the territories where the farm income is best.

The total operating income of the nation's farms as a business enterprise is vitally important to the necessary development of this business of producing our food and raw materials for our clothing. Whether or not present capital charges can be met, the actual costs of farm operations must be met with sufficient margin to provide for continuance and expansion if the nation's economic well-being is to be maintained. If this margin, or net operating income, is generous, a rise in land prices will certainly result. If it shrinks, the land speculator will not have a fruitful yield in agricultural regions.

The income of the farmers, after paying operating expenses and interest on borrowed money, provides for the personal expenses of the farmers and their families. If this income is too small to maintain a comfortable standard of living, personal distress must result among the farming people. Since the productive capacity of this nation is undoubtedly great enough to provide comfortable support for us all, there must be something wrong, which is a challenge to constructive thought, if any large and socially necessary economic group cannot make a comfortable living in the United States at the present time.

Unfortunately, it is impossible for the writer to bring up-to-date in complete detail all the estimates presented in the earlier article, which compared conditions in the year 1923 with those in 1913. Careful computations of all elements of income and expense for each year at least since pre-war years and comparisons based upon a broad pre-war period would be of very great value. This would give real evidence of tendencies based upon settled conditions. Since even the old and new estimates of the Department of Agriculture are not entirely comparable, and since the writer's facilities for original computations are limited, we shall build our present conclusions upon revisions of our earlier estimates, bringing them up to the last crop year as carefully as possible by the use of the new data of the Department of Agriculture.

## THE GROSS INCOME OF AGRICULTURE

The gross income of any business is the measure of its total spending power no matter what proportion of it is eaten up by expenses.

The total spending power of the agricultural community, both directly and indirectly, is the value of the products of the farms. The best national figure which we have of this for recent years is the gross income from farm production computed and published by the United States Department of Agriculture. The following table shows these figures for the past nine years. Unfortunately, this particular series of data has not been computed for the years before the abnormal period at the end of the war.

The annual figures for "cash income from sales" are the best available estimates of the yearly sums available from agriculture for the payment to the non-farming population for farm requirements, the farm families' personal requirements, such products and services as road materials and education paid for indirectly through taxation, and many other goods and services paid for indirectly through interest payments.

It will be noted that the national cash income from farm production is somewhat more than 10 per cent of the

GROSS VALUE OF FARM PRODUCTION AND GROSS INCOME[2]

(In millions of dollars; *i.e.*, 000,000 omitted)

| Year | Gross Value of All Farm Production | Deductions for Products Fed, Used for Seed, and Waste * | Gross Income from Farm Production | | |
|---|---|---|---|---|---|
| | | | Total | Value of Food and Fuel Consumed on Farms | Cash Income from Sales |
| 1919–20 | $24,025 | $8,306 | $15,719 | $2,887 | $12,832 |
| 1920–21 | 17,800 | 5,132 | 12,668 | 2,645 | 10,023 |
| 1921–22 | 12,894 | 3,680 | 9,214 | 2,129 | 7,085 |
| 1922–23 | 14,909 | 4,543 | 10,366 | 2,168 | 8,198 |
| 1923–24 | 16,249 | 4,961 | 11,288 | 2,360 | 8,928 |
| 1924–25 | 17,086 | 5,083 | 12,003 | 2,327 | 9,676 |
| 1925–26 | 16,995 | 4,325 | 12,670 | 2,535 | 10,135 |
| 1926–27 | 16,487 | 4,360 | 12,127 | 2,590 | 9,537 |
| 1927–28 | 17,033 | 4,780 | 12,253 | 2,437 | 9,816 |

* These deductions, to obtain gross income, cover portions of crops and dairy products fed to livestock, used for seed in further crop production, and waste. For the industry as a whole these deductions constitute raw materials, the income from which is derived from the finished products sold or consumed in the farm home.

total national income which, as usually computed, is now placed at about ninety billions of dollars.

The total gross income, including the value of food and fuel consumed on the farms, as shown in the third column, must be taken as the basis for computations of the economic status of agriculture and the people engaged in it. Following this rule obviates the possibility of changes in the degree of farm self-sufficiency distorting the index of the resources of the farmers.

Since the Department of Agriculture has not brought up-to-date the series of estimates of farm income in calendar years used in the earlier article and the new series, already shown, has not been computed for years earlier than 1919–20, we must roughly fit the two series of data together.

The total value of farm products (excluding duplications between crops and animal products) for the year 1923 was 156 per cent of the value for the year 1913. Much of this increase was due to the change in the value of the dollar. Deflating it by either the general wholesale price index of the Bureau of Labor Statistics or the new index number of the Department of Agriculture for prices of farm requirements, we find an index of the purchasing power of the total operating agricultural income of about 102 in 1923 using the year 1913 as the basis of 100.

The operating income for the year 1927–28 was 18 per cent greater than that for the year 1922-23, and 9 per cent greater than for the year 1923–24. Meanwhile, the index of the price of goods purchased by farmers for business and personal requirements remained practically constant and the wholesale price index declined several points.

It will be noticed that on this basis the purchasing ability of agriculture as an operating business shows a net increase rather than a decrease, when compared with the admittedly good

[2] Crops and Markets, July, 1928, p. 267.

years before the war. This is true either when related to the general change in the value of the dollar, or to the actual change in the prices paid by the farmers for their business and personal requirements.[3] On this latter basis the purchasing power of the farm operating income was 10–20 per cent greater in the crop year 1927–28 than in the calendar year 1913.

### INCOME AVAILABLE FOR DIRECT FARMER EXPENDITURE

The Department of Agriculture also publishes data which make it roughly possible to bring up-to-date the writer's earlier computations of the trend of the amount available for *direct* expenditures by operators from farming income for business and personal purposes. The computations for the year 1923 showed that in that year this amount was 142 per cent of the comparable amount for the year 1913. Making allowances for the changes in taxes on farm property and interest and rental charges, this index is raised to approximately 166 for 1927–28 on the basis of 1913 as 100. When this is related to the combined "living" and "production" price index numbers for farm purchase of 155, a purchasing power of 107 is found.

### COST OF FARM PRODUCTION

Since the Department of Agriculture's estimates of allowances for the labor of the farmers and their families are given as a residual item and not on the basis of labor cost, it is not possible on this basis to bring up-to-date accurately our old estimates of national farm expenses. Moreover, publication of census data on agriculture for 1925 show that the numbers of persons engaged in agriculture actually were declining in the decade from 1913 to 1923 instead of remaining constant as we formerly assumed tentatively. Consequently, our former estimates of cost indexes should unquestionably be revised downward. In the earlier article it was computed that the index of total cost for 1923 stood at 155.3 on the basis of 1913 as 100, while the income index stood at 156.2 and the general wholesale price level at 154. Our conclusion was that correcting both cost and income indexes for the change in the purchasing power of the dollar left virtually no change in the real cost of farm production nor of farm income during that decade, although the physical volume of production increased materially. We now find available a better price index for such purposes of deflation—the index of prices paid by farmers for commodities used in both production and living. Since this stood at 153, as compared with the wholesale price index of 154 for 1923, no material correction is required from that angle. However, as stated above, the results of the agricultural census of 1925 show clearly that the cost index of 155.3 was materially too high. Consequently, we must conclude that in that decade the increased physical production was accomplished with such an increased efficiency, that the enlarged output was secured with an actual decrease in total cost, measured in terms of deflated dollars.

During the decade 1913–23 the quantitative output of agriculture increased approximately 19 per cent. Since the total cost in terms of deflated dollars also decreased, the cost per unit of output must have decreased at least 17 per cent during that decade.

Since 1923 the total "operating costs" as estimated by the Depart-

[3] The writer feels constrained to congratulate the Department of Agriculture for developing this index and other matters pointed out as greatly needed in the article in the earlier number of *The Annals*.

ment of Agriculture have increased. For 1922–23 the figure given is $2,501-000,000; for 1923–24 it is $2,760,000,000 and for 1927–28 it is $2,970,000,000. This is an increase of 18 per cent from 1922–23 and 8 per cent from 1923–24. At the same time the total gross income increased by about the same percentages without any very marked net change in price per unit. In other words, these "operating costs" remained approximately constant per unit of output. At the same time other costs separately listed by the Department, but counted by the writer in his earlier computations of cost, showed no such increase. On this showing it would appear that the total cost per unit of output declined slightly during these last few years. Moreover, it is common knowledge that agricultural implements, with productive capacity for years to come, have been purchased heavily during recent years. It seems therefore, that part of these operating costs might well be transferred from a current cost item to one classed as "increase of capital." If this is so, the decrease in current cost per unit of product must have continued strongly through recent years.

### NET INCOME OF FARMERS

The estimate for the part of farm income left for the personal expenses of owners and operators made in the earlier article showed an index of 139 for 1923 on the basis of 1913 as 100, and on the assumption that the number of people in this category remained constant. Correction for the change in the number of farmers shown by the census would give an index of 142 for the personal income of operators. The data of the Department of Agriculture based on crop years show that the "reward for labor and management" per farm family in 1927–28 was 49 per cent greater than in 1922–23 and 23 per cent greater than in 1923–24. Taking the average of these two to bring up to date our earlier computations, the index for 1927–28 would be approximately 193 as compared with 142 in 1923 and 100 in 1913. This must be compared with the index number of farm "living" prices which stood at 161 for the year 1927 and 162 for the first half of 1928. Thus the income of the farm family last year was materially above the pre-war standard. The "average farm family" wage earnings or reward for labor and management estimated by the Department of Agriculture show the same percentage change from 1919–20 to 1927–28 as do their data on prices for farm living expenses. In other words, the purchasing power of the farmer's personal income is as good as in the post-war boom and materially better than in the best pre-war years.

### COMPARISONS WITH OTHER ECONOMIC ACTIVITIES

The annual figures for farm income given above show only a moderate tendency to increase since our economic life became reasonably stabilized after the war. And yet it is a commonly accepted fact that the total national income has increased very greatly during recent years, although complete estimates for the last few years are not available.

Comparisons between index numbers of farm family income and factory wages show varying results depending upon what is taken as the base period. In the last five years the farmer's income has increased about 50 per cent, while the factory worker's wage has increased about 8 per cent. However, when the post-war boom period is taken as the base, a different result appears. The factory wage has gone up 2 per cent, while the farm income has gone down 27 per cent. When the

pre-war base is taken, the farmer's income stands, as we have seen, at 193, while the data of the National Industrial Conference Board show the average wage in twenty-three industries at 217 in 1927.

Absolute comparisons between farmer's incomes and incomes of city dwellers have been common during recent years. The writer has always protested that all such comparisons were but half truths and, as such, highly dangerous for purposes such as this discussion. As data on spendable cash income, such data have great usefulness. The commonly accepted data present such a deplorable case for the farmer as to challenge the intelligence of all who stay on farms in such circumstances. Since those who really know farmers know that they as a class are fully as intelligent as the national average, we naturally tend to look for explanations not revealed by the figures. Such explanations are readily available. Many of the most important items of expense to the city dwellers are obtained by the farmer very cheaply or without cash outlay. Moreover, the tendency is to compare the farmer's income from the farm alone with the average national income. Those intimately acquainted with farm life of today realizes that many farmers, as well as city dwellers, receive a material portion of their income from other sources than their primary occupation. Road-making is a real source of income for the farmers today, as lumbering used to be. The writer has also found a material amount of income to farmers from investments in most unexpected places. Dr. Black has made such execellent comments on these comparisons in a recent article that we take the liberty of quoting one paragraph therefrom:[4]

[4] J. D. Black, "Income Data from Farm Business Surveys," *The Review of Economic Statistics*, November, 1928, p. 176.

If a figure for farm income in the country is needed for income analysis, the best procedure with such survey data is to subtract the unpaid labor item from expenses and add value of living obtained from the farm to receipts, which would increase farm incomes approximately $700 on the average. If a comparison with city income is wanted, the best that can be done is to convert the living obtained from the farm to a city-valuation basis, and to estimate the value of the opportunities for genuine income that the boys and girls in the family would avail themselves of in the city. It need hardly be stated that such a comparison would have to be on a very flimsy foundation at present, and an uncertain foundation even if all possible data were available. There are too many incommensurables in such a problem. Take housing as an example: is an eight-room house on a farm with all modern conveniences the equivalent in living value of a similar house in a good residential district in a town? Is a house without a furnace and water system worth no more relatively in the country than it would be in the city? Even in the matter of food, there are difficulties: urban families do not ordinarily consume so many calories as farm families of the same size. On the other hand, farm families need less of expensive clothing. Then there is a large group of more intangible values involved—the advantages of living close to good schools, churches, doctors, hospitals, theatres, libraries, *vs.* the advantages of clean air, more sunlight, and more quiet. The least that anyone can do who broadcasts figures purporting to show relative well-being of farmers and urban people is to list carefully all of these omissions and qualifications and possibly make some sort of a rough evaluation of them.

## FARM PRICES

When price data are used, we find an appearance of a depressed condition today in the business of farming, as compared with pre-war years. The index number of the price of farm products averaged 131 in 1927 and varied from 134 to 148 during 1928 on a basis of the pre-war half decade as 100.

On the same basis the prices paid by farmers varied from 154 to 157. Thus the purchasing power of farm products, at the farm has recently varied from 85 to 95, using the pre-war half decade as a basis of 100.

However, prices alone and their purchasing power are not worthy the emphasis frequently given them in discussion of this problem. Our most flourishing automobile industry would make a much worse showing on this basis than farming. Any real farmer knows that price without crop is a bitter disappointment, and that bumper crops with moderate prices may bring prosperity. It is the total income—price multiplied by quantity—which is the first important matter. Net income, which also takes account of changing costs, is the vital matter for the farmers.

In view of the decrease in unit costs discussed above, amounting to upwards of 17 per cent since 1913, it may seem surprising that the purchasing power of farm products has declined but about 10 per cent over the period. The reason for the smaller decline in purchasing power than in unit costs lies, of course, in the fact that costs in the production of non-farm goods have also declined strikingly in terms of deflated dollars.

### FARM EFFICIENCY INCREASING

A few years ago the writer was practically alone in his contention that farm efficiency was so increasing that unit costs were heading downward, and that this fact must be counted in dealing with the farm income situation. Since then the studies of Durand, Thomas, Day and others have shown the great increase in efficiency in both industry and agriculture. The output per worker on the farm increased 57 per cent from 1898–1900 to 1926–27, and 27 per cent from 1918–20 to 1926–27, according to Dr. Durand's computations.[5] Dr. Baker's computations, given elsewhere herein, show that very great efficiencies have been at work recently in agriculture giving a great increase in the total national production of food and other farm products without a corresponding increase in land employed, and that food production is expanding much more rapidly than the national population.

The extreme break in the prices of farm products in 1921 was due, of course, to economic causes outside of agriculture. The persistent maintenance of a purchasing power of farm products below the pre-war level and a declining share of the farmers in the total national income cannot be due entirely to outside causes. Persistently declining national average costs of production and a rate of output mounting more rapidly than the growth of population tend definitely toward lower prices. Lowered prices in 1921 doubtless helped to introduce economies that resulted in lowered costs. However, efficiencies were being introduced before 1921, and the declining costs coming from efficiencies have tended definitely toward lower prices.

Agriculture is not alone in this situation. Declining costs in other branches of production are tending toward lower general price levels. It is practically unknown for any industry to retain for itself all the benefits of its own increased efficiency.

The recent advance in farm efficiency, unfortunately, has not been uniform in all parts of the country and among all classes of farmers. Dr. Baker's studies show very clearly that progress has not been evenly distributed geographically. It is a matter of common knowl-

[5] E. Dana Durand, "Progress in National Efficiency," Sixteenth Annual Report of the Secretary of Commerce, pp. XXIX–XXXIII.

edge also that improvements in technique are never adopted uniformly by producers within any kind of economic community. Much of the real distress among the farmers, as well as among other economic groups of the national population today, is really found with those individuals who, for one cause or another, are not keeping pace with the rapid advance in the adoption of improved technique by the group as a whole.

## THE COMPARATIVE POSITION OF AGRICULTURE

Why, though, since other industries have also increased their efficiency in late years, is it that farm prices are low in comparison with the prices of other products and the farm income is not increasing as rapidly as the national farm income? This seems unfair to the farmers. The reason lies in two factors. One is that the costs of distribution, which enter so largely into the prices of things farmers (and others) buy, have not declined as have the costs of agriculture and manufacturing. Another factor is still more far-reaching and less readily accepted as yet. It is that the demand for farm products is not increasing as rapidly as the demand for other products, nor even as rapidly as the farm production.

The problem of reducing the costs of distribution is now being attacked vigorously by the Government and other agencies. Good results are appearing.

The problem of a greater expansion of farm output than the demand for its products is potentially serious. The writer has for years protested against the impending-starvation theory. The real facts are now becoming so apparent that they are more generally faced. The history of modern civilization shows that among Western peoples a smaller and smaller proportion of the people is required in agriculture in order to feed the total population ever more generously. Increased efficiency in all branches of economic life brings more production per person in the total population. But in what lines can we increase our consumption? Our intake of food cannot be increased appreciably in quantity. Its quality and cost in terms of human effort are being increased somewhat through the use of a greater proportion of animal products and through the use of less seasonable fruits and vegetables. Such increased demands upon the farms per unit of total population are limited, however, and the fact has been with us for a century that our food production employs a decreasing proportion of our population on the farm. This is a world-wide phenomenon where western civilization rules. The increasing human demands must be diverted to what would have been luxuries to our ancestors. The maintenance of life consumes a decreasing share of our total energies, and farm production is largely engaged in supplying the means for the mere maintenance of life. The natural sequel is that farm prices and farm incomes are sufficiently low to divert a steady stream of people from farming to other occupations.

We realize today, as we did not a decade ago, that this is true of farming and of other basic industries as well. Men must be diverted to other activities catering to what would once have been classed as luxury demands. The result is a keener struggle for existence in farming and these other industries whose products are not subject to an increasing per capita demand.

When confronted, as we are, with facts showing a tendency toward a decline in the growth of population in this country and in our chief foreign food markets, we see the seriousness of

the situation. Dr. Baker points out that our national agricultural production increased 13.5 per cent, while our population increased only about 8 per cent. Dr. Kuczynski[6] shows that even in England, the world's chief food importer, the present birth rate is not great enough to maintain the population of that country. No wonder that our farmers are receiving a diminished share of our national income!

In view of the fact that the demands upon our farms are not likely to grow more rapidly than our total population, and that increased per capita expenditures will be largely for non-farm products, we can hardly hope to see the farm income rise as rapidly as the total national income. Those who claim that the farms should by rights receive a full share of the national income look on the matter superficially if they claim this for the total farming population. However, the claim may, with reason, be made for the farmers as individuals. If our economic life were thoroughly balanced at all times, the numbers employed in agriculture might be kept so reduced that the average farm income would keep pace with the average national income.

This latter situation is an end highly to be desired. It is but justice that the prosperity of our farmers should equal the prosperity of their city cousins. Such an end can hardly be secured by simple means, however. It cannot be expected to be attained if obstacles, such as "keep the boy on the farm" propaganda, are placed in the way of occupational migration to other livelihoods. Neither can it be expected from measures which will artificially maintain prices while allowing farm production to go on increasing faster than its market.

Real solution of the farm income problem demands radical and far-reaching measures for its solution. A board engaged in its study might well inquire as to whether or not our farm traditions tend toward keeping too large a share of our population on our farms; whether or not our agricultural educational policies tend toward an increase in production not based upon market demands as expressed in price; whether or not national policies which help individual farmers so encourage increased production as to prove a detriment to the whole body of farmers.

The dairy farmers of the Philadelphia area, under wise economic leadership, have shown that the serious problems of seasonal surplus can be controlled to the advantage of both producer and consumer. This has been done by going to the root of the problem and controlling the cause. At the same time those dairymen who have attempted to control price, while neglecting its cause, have not met with such success. If the dairy farmers can find a solution for their chief troubles, a solution is not impossible for the larger problems of the farm income. It will be necessary, however, to go deeper than the superficial symptoms and to attack the underlying causes of the situation.

[6] Robert Kuczynski, "*The World's Population*," *Foreign Affairs*, October, 1928, pp. 30–40.

# The Recent Trend in the Purchasing Power of Farm Products

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FROM 1921 to and including 1925, one could say definitely, with reference to the relative exchange position of agriculture, that a sick industry was improving. As for the last three years, about the most that can be said is that the patient has been convalescent. The season of 1925 apparently marked a high point in agricultural recovery, as respects the past eight years. A minor slump occurred in 1926 and 1927, with some symptoms of improvement again last year.

There are various ways of appraising the purchasing power of farm products. The method here used of comparing unit prices is a simple method, involving less exercise of fallible judgment than where gross and net estimates are attempted; and while it cannot be presumed to picture the farmer's status at a given moment it undoubtedly reflects the trend fairly accurately over a period of time. When, over a period of time, the unit price of a composite quantity of farm products is compared with the unit price of a composite quantity of things commonly required and bought by farmers, the relative exchange value of the first is fairly well indicated.

## COMPARISON OF PRICES

Until recently there have been no adequate data in existence on prices actually paid by farmers for the commodities they buy and use. Formerly the comparison usually made was between prices of farm products at the farm and prices of non-agricultural commodities at wholesale. But this was never an accurate comparison because farmers buy at retail prices, not at wholesale.

Last year, however, the Division of Statistical and Historical Research of the U. S. Bureau of Agricultural Economics worked out an index of retail prices actually paid by farmers, and

TABLE I—THE TREND OF PURCHASING POWER OF FARM PRODUCTS IN TERMS OF THINGS FARMERS BUY
(1910–14=100)

| Year | Purchasing Power Index | Year | Purchasing Power Index |
|---|---|---|---|
| 1910 | 106 | 1920 | 99 |
| 1911 | 93 | 1921 | 75 |
| 1912 | 99 | 1922 | 81 |
| 1913 | 99 | 1923 | 88 |
| 1914 | 101 | 1924 | 87 |
| 1915 | 95 | 1925 | 92 |
| 1916 | 95 | 1926 | 87 |
| 1917 | 118 | 1927 | 85 |
| 1918 | 112 | 1928 | 89 |
| 1919 | 102 | | |

this gives a more desirable basis for unit price comparsion of this sort. Of course the ratio of one price series to the other does not convey how much the farmer had on hand to sell at the price. Yet the price itself at any given time is the resultant of supply conditions, largely, in the case of farm products, and it usually holds true that seasons of high prices are also seasons of greater total income to farmers while low prices mean less income.

The comparison of prices is especially significant in the fall of the year when farmers are marketing their produce in heavy volume. The level of prices received by farmers in the autumn has fluctuated quite widely during the last four years, being substantially lower last fall than in 1925. This was due primarily to lower prices for wheat, fruits, and vegetables, since cotton and most livestock products were as high or higher in November, 1928, than three years previous.

On the other hand, composite prices of things farmers buy for use in production were practically as high in November, 1928, as three years previous. This meant that the exchange value of farm products was somewhat lower last fall than three years ago.

A reference to Table III will give some idea as to what products are up and what down. This table includes the ten representative products of American farms.

At first glance it is evident that the livestock group has shown up in stronger exchange position than have the crops, using the November figures of the three years past.

Cotton has had a fairly advantageous price position except for the overwhelming acreage and crop of 1926. Corn has not done very well. Wheat has increased in output and declined in relative price. Hay presents a sad story of vanished market; it is a side-line crop on most farms, grown for home consumption. Potatoes had three good years and were increased in output until last fall their purchasing power per unit was the lowest of the chief crops.

Beef cattle have been moving into a steadily more advantageous exchange position. So many hogs came to market last fall that their prices declined materially. The purchasing power of eggs has declined slowly since 1925, but is still fairly high. Butter and wool have retained a stable price position.

The few figures in this table sketch quite clearly the economic high lights and shadows in the current agricultural picture. It is not the areas producing beef cattle or milk or sheep that

TABLE II—PRICE RELATIONSHIPS IN THE FALL MARKETING SEASON DURING THE LAST FOUR YEARS
(1910–14 = 100)

| | Prices Received by Farmers | Prices Paid by Farmers | Purchasing Power of Farm Products |
|---|---|---|---|
| November, 1925 | 144 | 158 | 91 |
| November, 1926 | 130 | 155 | 84 |
| November, 1927 | 137 | 154 | 89 |
| November, 1928 | 134 | 157 | 86 |

are calling for relief at present. But when potatoes have a purchasing power index of 52, the great potato growing regions are in difficulties, just as was the South in the fall of 1926 when cotton had a purchasing power of 57. However, both these potato and cotton instances are cases of temporary overproduction which can be and usually are corrected in a short time. More lingering are the difficulties of a region like the Corn Belt with its complex adjustment of crop and livestock enterprises, or the Wheat Belt with its rapidly shifting system of production and a world-wide market to meet.

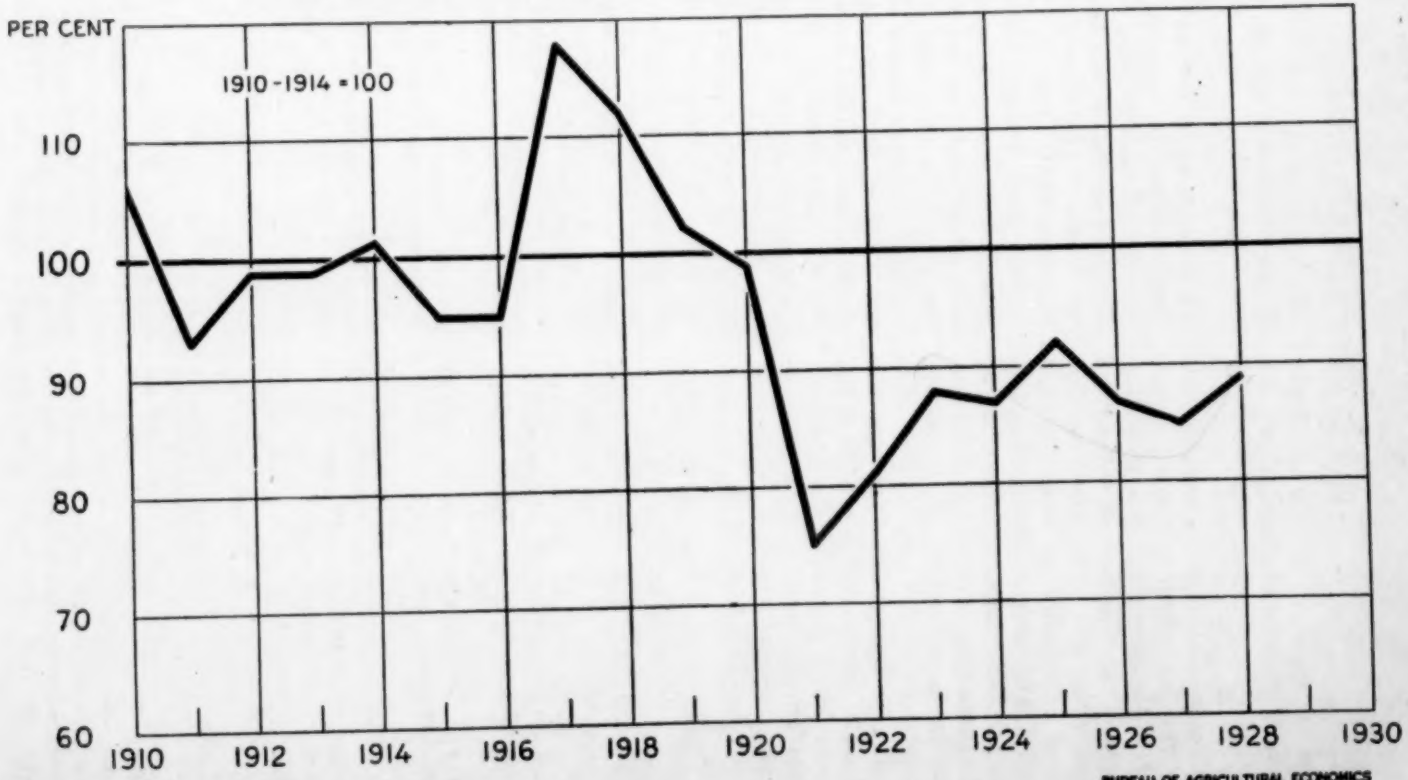
Apart from the varying regional handicaps raised by relatively high prices of things farmers must buy, there is a field of exchange which puts farmers universally at a disadvantage in these times. That is the field of taxes and interest. About 20 per cent of all farm expenditures are in payment of taxes and interest. The exchange value of farm products in terms of taxes and interest is lower now than it was four years ago.

Summing up the matter, it may be repeated that the unit purchasing power of farm products, in general, increased from a low ebb in 1921 up to a point approaching the pre-war parity in 1925, since when it has declined somewhat though 1928 again brought an upward trend. It is apparent that production in the important crop lines is treading closely on the heels of profits, either actual or expected. In fact, wheat, corn, cotton, and potatoes have each overstepped the bounds at least once within the last four years, each of these going down temporarily to a very disadvantageous level of exchange value. It is apparent that the important livestock lines are in relatively strong exchange position, beef cattle, dairy, sheep, and poultry all confirming this by a present tendency to expand production. The swine industry has not been in good shape, but seems to have the stage set for fewer pigs and presumably higher prices this year. On the whole, the relationship of farm prices of farm products to retail prices of things farmers buy has assumed a measurable degree of stability during the past six years. But the disparity between them persists.

TABLE III—RELATIVE PURCHASING POWER OF IMPORTANT FARM PRODUCTS IN TERMS OF THINGS FARMERS BUY
(1910–14 = 100)

| | November 1925 | November 1926 | November 1927 | November 1928 |
|---|---|---|---|---|
| Cotton | 92 | 57 | 104 | 92 |
| Corn | 73 | 66 | 75 | 74 |
| Wheat | 106 | 90 | 82 | 70 |
| Hay | 70 | 72 | 58 | 59 |
| Potatoes | 180 | 131 | 89 | 52 |
| Beef cattle | 75 | 79 | 100 | 113 |
| Hogs | 93 | 102 | 81 | 75 |
| Eggs | 138 | 135 | 125 | 117 |
| Butter | 115 | 110 | 114 | 114 |
| Wool | 134 | 115 | 114 | 129 |

TREND OF PURCHASING POWER OF FARM PRODUCTS
IN TERMS OF THINGS FARMERS BUY, 1910-1928



# The Trend in the Farm Ownership

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IT is probable that less basic information is available concerning quantitative trends of farm ownership than for any other important category of farm economics. The census has provided information at each decennial period, and again in 1925, concerning the number of farm operators who own the farms they operate, but this information is subject to very definite limitations.

The following table presents the trend in various census periods of the major tenure groups of farm operators classified by number, total land in farms, improved land in farms, and value of real estate operated.

## Trend in Farm Tenure for the Entire United States

During the fifteen years 1910–1925, the percentage of farms operated by full owners declined slightly, but the decrease in relative importance of this class of operators was much greater when measured by per cent of land in farms, per cent of improved land, and per cent of value of farm real estate. The only reversal of this trend was in the tenure distribution of the latter item from 1920 to 1925.[1]

Since part owners (owners additional) and managers operate both land owned and land rented by the operator, it is clear that the above figures do not show exactly the acreage and value of land operated by the owner as distinguished from the land rented by the operator. We have no information at present as to the area of manager-operated land which is rented by the operator, but this class is of relatively small importance, and we are

[1] This exception in the trend reflects the fact that the relative increase of owner operators occurred in the Northeastern States and the Pacific coast areas, in which the declines in real estate values were small, while the heavy decreases in relative numbers of owners occurred in those parts of the country which experienced a severe deflation in the value of farm real estate.

TABLE I—Tenure of Farm Operators Measured in Four Ways

| | Per Cent of Total Number of Farms | | | Per Cent of Total Land in Farms | | | Per Cent of Total Improved Land | | | Per Cent of Total Value of Farm Real Estate | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1910 | 1920 | 1925 | 1910 | 1920 | 1925 | 1910 | 1920 | 1925* | 1910 | 1920 | 1925 |
| Full owners | 52.8 | 52.2 | 52.0 | 52.9 | 48.2 | 45.4 | 48.9 | 46.8 | 42.3 | 50.6 | 46.3 | 48.9 |
| Part owners | 9.3 | 8.6 | 8.7 | 15.2 | 18.4 | 21.3 | 15.9 | 15.7 | 18.5 | 14.5 | 13.8 | 13.8 |
| Managers | 0.9 | 1.1 | 0.7 | 6.1 | 5.7 | 4.7 | 2.5 | 2.6 | 2.2 | 4.1 | 4.0 | 3.2 |
| Tenants | 37.0 | 38.1 | 38.6 | 25.8 | 27.7 | 28.6 | 32.7 | 34.9 | 37.0 | 30.8 | 35.9 | 34.1 |

* The question on improved land was omitted in the census of 1925. The figures given in this column are rough estimates arrived at by adding crop land harvested, plowable pasture, and land in crop failure, fallow or idle, prorated among the tenure groups in proportion to the tenure distribution of crop land harvested.

able to break up the part-owner group into land owned and land rented. Excluding the comparatively small area operated by managers, the percentages of acreage and of value of farm real estate operated by the owners of the land were as follows:

The very minor change in percentage of farms operated by owners for the country as a whole also conceals very notable changes in this regard in various parts of the country, tending to neutralize one another in the national aggregate. This is revealed in the following table showing trend by states from 1900 to 1925 in the percentage of farms operated by owners, part owners, and managers. The combination of the three groups is justified on the ground that the three classes represent the entrepreneurs who enjoy the independence and general social and economic status of owner-farmers, even though a part of the land they operate in the case of managers and part owners may be rented. The reciprocal percentage in each case also constitutes the percentage of farms operated by tenants.

TABLE II—PERCENTAGES OF TOTAL FARM AREA, IMPROVED AREA, AND VALUE OF FARM REAL ESTATE (EXCLUDING THAT CONTROLLED BY MANAGERS) OPERATED BY THE OWNERS OF THE LAND, 1925, 1920, 1910, AND 1900

| Date | Acreage | | Value of Real Estate |
|---|---|---|---|
| | Total | Improved | |
| 1925 | 59.0 | 53.7 | 57.8 |
| 1920 | 60.7 | 56.2 | 56.4 |
| 1910 | 64.4 | 59.0 | 60.5 |
| 1900 | 65.8 | 62.5 | 64.6 |

It is clear from both of the preceding tables that the comparatively small change in percentage of farms operated by owners covers up a very considerable and unbroken trend of a decrease in the total acreage and improved acreage in farms operated by owners, and a correspondingly large increase in the total acreage and improved acreage operated by tenants (approximately the reciprocals of the above percentages). The trend in these items was continuous for all the census enumerations since 1900. Indeed, it is a continuation of a trend which goes at least as far back as the first tenure enumeration, made in 1880. In the case of improved acreage the change from 1920 to 1925 was greater than in any decennial period since 1900, but it should be noted again that the figure for 1925 is only an estimate. In the case of the value of farm real estate operated by owners, the trend is reversed from 1920 to 1925, probably for the same reason pointed out above in connection with the similar change in percentage of full owners.

## REGIONAL CHANGES IN OPERATING OWNERSHIP

The table shows that during the five-year period ending in 1925 very extensive changes occurred in the percentage of farms operated by owners, as distinguished from tenants—changes, in fact, more rapid in about half the states than occurred in any preceding decennial period since 1900, and in a large proportion of the other states, nearly as extensive as in any other pre-

TABLE III—PER CENT OF ALL FARMERS WHO WERE FULL OWNERS, PART OWNERS, AND MANAGERS FOR 1925, 1920, 1910, AND 1900

| | 1925 | 1920 | 1910 | 1900 | | 1925 | 1920 | 1910 | 1900 |
|---|---|---|---|---|---|---|---|---|---|
| United States | 61.4 | 61.9 | 63.0 | 64.7 | South Atlantic: | | | | |
| New England | 94.4 | 92.6 | 92.0 | 90.6 | Delaware | 64.2 | 60.7 | 58.1 | 49.7 |
| Middle Atlantic | 84.2 | 79.3 | 77.7 | 74.7 | Maryland | 73.6 | 71.1 | 70.5 | 66.4 |
| East North Central | 74.0 | 71.9 | 73.0 | 73.7 | District of Columbia | 71.9 | 58.3 | 61.3 | 56.9 |
| West North Central | 62.2 | 65.8 | 69.1 | 70.4 | Virginia | 74.8 | 74.4 | 73.5 | 69.3 |
| South Atlantic | 55.5 | 53.2 | 54.1 | 55.8 | West Virginia | 83.7 | 83.8 | 79.5 | 78.2 |
| East South Central | 49.7 | 50.3 | 49.3 | 51.9 | North Carolina | 54.8 | 56.5 | 57.7 | 58.6 |
| West South Central | 40.8 | 47.1 | 47.2 | 50.9 | South Carolina | 34.9 | 35.5 | 37.0 | 38.9 |
| Mountain | 77.8 | 84.6 | 89.3 | 87.8 | Georgia | 36.2 | 33.4 | 34.4 | 40.1 |
| Pacific | 84.4 | 79.9 | 82.8 | 80.3 | Florida | 78.7 | 74.7 | 73.3 | 73.5 |
| New England: | | | | | East South Central: | | | | |
| Maine | 96.6 | 95.8 | 95.7 | 95.3 | Kentucky | 68.0 | 66.6 | 66.1 | 67.2 |
| New Hampshire | 95.2 | 93.3 | 93.1 | 92.5 | Tennessee | 59.0 | 58.9 | 58.9 | 59.4 |
| Vermont | 90.7 | 88.4 | 87.7 | 85.4 | Alabama | 39.3 | 42.1 | 39.8 | 42.3 |
| Massachusetts | 95.2 | 92.9 | 91.9 | 90.4 | Mississippi | 31.7 | 33.9 | 33.9 | 37.6 |
| Rhode Island | 87.9 | 84.5 | 82.0 | 79.8 | West South Central: | | | | |
| Connecticut | 93.6 | 91.5 | 90.2 | 87.1 | Arkansas | 43.3 | 48.7 | 50.0 | 54.6 |
| Middle Atlantic: | | | | | Louisiana | 39.9 | 42.9 | 44.7 | 42.0 |
| New York | 85.9 | 80.8 | 79.2 | 76.1 | Oklahoma | 41.4 | 49.0 | 45.2 | 56.2 |
| New Jersey | 84.1 | 77.0 | 75.2 | 70.1 | Texas | 39.6 | 46.7 | 47.4 | 50.3 |
| Pennsylvania | 82.6 | 78.1 | 76.7 | 74.0 | Mountain: | | | | |
| East North Central: | | | | | Montana | 78.1 | 88.7 | 91.1 | 90.8 |
| Ohio | 74.5 | 70.5 | 71.6 | 72.6 | Idaho | 75.6 | 84.1 | 89.7 | 91.2 |
| Indiana | 70.8 | 68.0 | 70.0 | 71.4 | Wyoming | 82.1 | 87.5 | 91.8 | 92.4 |
| Illinois | 58.0 | 57.3 | 58.6 | 60.7 | Colorado | 69.1 | 77.0 | 81.8 | 77.4 |
| Michigan | 84.9 | 82.3 | 84.2 | 84.2 | New Mexico | 82.9 | 87.8 | 94.5 | 90.6 |
| Wisconsin | 84.5 | 85.6 | 86.1 | 86.5 | Arizona | 78.5 | 81.9 | 90.7 | 91.6 |
| West North Central: | | | | | Utah | 88.9 | 89.1 | 92.1 | 91.2 |
| Minnesota | 72.9 | 75.3 | 79.0 | 82.7 | Nevada | 92.1 | 90.6 | 87.6 | 88.6 |
| Iowa | 55.3 | 58.3 | 62.2 | 65.1 | Pacific: | | | | |
| Missouri | 67.4 | 71.2 | 70.1 | 69.5 | Washington | 83.7 | 81.3 | 86.3 | 85.6 |
| North Dakota | 65.6 | 74.4 | 85.7 | 91.5 | Oregon | 83.2 | 81.2 | 84.9 | 82.2 |
| South Dakota | 58.5 | 65.1 | 75.2 | 78.2 | California | 85.3 | 78.6 | 79.4 | 76.9 |
| Nebraska | 53.6 | 57.1 | 61.9 | 63.1 | | | | | |
| Kansas | 57.8 | 59.6 | 63.2 | 64.8 | | | | | |

ceding decennial period. Evidently, the depression in American agriculture and other conditions were exerting a profound influence on changes in the percentage of owner-farmers.

There was a remarkable identity in direction of change for states in particular geographic groups. Thus, in all the New England States there was a very marked increase in per cent of owner-farmers. The same direction of change follows on down the Atlantic coast as far as North Carolina. The increase in per cent of owners was very marked in the three Middle Atlantic States, and in Delaware and Maryland of the South Atlantic group. There was a slight increase in Virginia, but this state evidently marks the boundary of the general trend. The same general trend is found in the two states, Ohio and Indiana, just to the west of the North Atlantic groups.

It should be noted that this trend occurred in a general region characterized by a high degree of urbanization and a rapid tendency in that direction. This suggests the hypothesis that the

marked trend toward a larger proportion of farms operated by owners (including part owners and managers) is connected with tendencies toward urbanization. It probably reflects in part the increase in types of farming for the immediate supply of cities, such as dairy farms, poultry farms, truck and fruit farms, and flower and other specialty farms. It is well known that these types of agriculture are much better adapted to ownership than to tenant economy. Another factor, especially in New England, has been the tendency of urban population, by reason of the post-war housing shortage, to move out to the country to occupy available farm homes and commute to work in the city. It is probable also that there has been an increase in New England and other North Atlantic regions in the number of "amphibian" farmers, families residing on farms and dividing their occupational time between farming and urban employments.

It is not improbable that similar connections between urban development and the trend toward an increased percentage of owner-operators is responsible for the latter tendency in Michigan, Florida, and the three Pacific Coast States. In California particularly, the increase in the percentage of owner-operators was very marked (from 78.6 to 85.3).

That there was a distinct tendency toward an increase in owner-operated farms in the vicinity of cities is brought out in the map (Fig. 1). The map also shows such a tendency in the Appalachian region, particularly the southern Appalachians, where it is probably associated partly with urban development and partly with the development of mining, lumbering and other rural industries.

The percentage of farms operated by owners declined in nearly all of the states which are predominantly agricultural. This was particularly marked in most of the North Central States, the Southern States, and the Mountain States; in fact, in most of the predominantly agricultural areas, and especially in those areas where the effects of depression, particularly of land value deflation, have been severe. Only a few exceptions to the rule appear, and these consist of states where a strong trend toward urbanization, with the attendant influences mentioned above, tended to offset the opposite tendency in the farming regions. Such states of conflicting tendencies, for instance, were Illinois and Wisconsin.

In all other West North Central States, except Illinois, the percentage of tenant-operated farms increased, the increases ranging from approximately two percentage points in Minnesota and Kansas to as much as nine points in North Dakota. The shift away from operating ownership was even more pronounced in the Mountain States. For the group as a whole the increase in the percentage of tenant-operated farms amounted to nearly seven points. In Montana, it was more than ten points. The change seems more pronounced in states lying partly in the Great Plains, such as the Dakotas and Montana, than in states lying entirely west of the front ranges of the Rocky Mountains. It should be noted that in both groups the shift toward tenancy is a continuation of a strong tendency in that direction which occurred in the preceding decade. For instance, in North Dakota the percentage of tenancy increased in the fifteen years following 1910 from 14.3 per cent to 34.4 per cent, and in Montana from 8.9 per cent to 21.9. In part no doubt this trend is associated with the economic distress in these states since 1920, but in part it represents the usual increase of tenancy which occurs in the years follow-

ing the homestead stage of development.

Kentucky and Tennessee show little change. In fact, the per cent of farms operated by owners has been almost constant in these two states during the past quarter century. Florida, where the percentage of owner farming increased, is exceptional by reason of its residential development. In all the other cotton states there was a well-marked increase in the per cent of tenant operators except Georgia. In this state the percentage of farms operated by owners actually increased, although the number of owners decreased. The number of farms in the state declined by about one-fifth, but the decrease in tenant farms was considerably larger than the decrease in farms operated by owners. The series of disastrous years experienced in this state due to low prices, boll weevil, drouth and other conditions largely disrupted the plantation system. A large proportion of planters were forced to discontinue or to restrict largely the scope of operations. Thousands of Negro croppers, finding their usual advances of food and supplies cut off, left the plantations. Since cropper tracts are counted as farms, there was a large nominal disappearance of tenant farms, though such so-called farms in many instances continue to be integral parts of plantations.

This same tendency occurred, though in less marked extent, in adjacent parts of neighboring states such as the piedmont section of South Carolina and middle Alabama. On the other hand, in the western part of the Cotton Belt there was a pronounced swing in the direction of a greater percentage of tenant farming.

The tendencies in Georgia illustrate the fact that the statistical trend in proportion of farms operated by owners covers up a number of component trends. Thus, in Georgia, there was a large decrease in total number of farms, while in western Texas and Oklahoma there was a large expansion in total number of farms and in farm acreage as a result of subdivision of cattle ranches and their conversion into cotton farms.

Among Negro farmers in the Southern States there was a slight decrease in per cent of farms operated by owners for the South as a whole, but the changes were diverse in the several parts of the South. In the South Atlantic Division the proportion of owner-farmers increased several percentage points. There was a slight decrease in the East South Central group and a considerable decrease, of nearly four percentage points, in the West South Central group.

It is impracticable in so brief an article to analyze by states or subdivisions thereof all the diverse changes which have had as a net result the trends in the percentage of farms operated by owners which have been described. In fact for many of these changes we have no statistical data. The trends in various localities reflect the relative extent to which owner-farmers have become discouraged and have entered other occupations either in greater or less numbers than tenants have done. To some extent they reflect the fact that owners have been unable to maintain their tenure position and have reverted to a tenure status. In some measure owners have lost their farms by foreclosure and forced sale, and their land has fallen into the hands of creditors who have been compelled to rent it to tenants. Without doubt these trends reflect also the fact that many young people who would have chosen farming as an occupation in a more prosperous period have decided to cast their lot with other occupations.

On the other side of the picture it is not improbable that some tenants have been enabled to climb into the class of owners by obtaining bargains in land disposed of at forced sale. It is impracticable to measure the relative extent of these diverse influences.

### MORTGAGE INDEBTEDNESS

Trends in relative extent of farms operated by owners should be considered also in relation to changes in extent and proportion of mortgage indebtedness. The percentage of the total number of farms operated by owners and by part owners reporting mortgage debt decreased in the United States as a whole by one percentage point from 1920 to 1925.[2] This decrease also occurred in all the geographic divisions except the three Southern census groups. The decrease was especially marked in New England and the Middle Atlantic States. In the latter group the percentage decreased as much as from 38.3 to 31.8. The slight decrease in percentage of farms reporting mortgage indebtedness in the North Central groups of states may have been partly due to the fact that foreclosures or forced sales of heavily mortgaged farms more than offset the number of new mortgages that were necessarily incurred.

The total amount of mortgage indebtedness for the country as a whole increased about 13 per cent in the five years ending in 1925. This increase is significant when it is considered that the percentage of the total number of owner-operated farms mortgaged decreased slightly, that a certain amount of indebtedness was wiped out by foreclosure, and that the value of farm real estate decreased nearly 25 per cent.

[2] Since a certain number of owner farms fail to report at all, our unknown percentage of the non-reporting farms were probably in the mortgaged class.

Naturally, there was a large increase in per cent of mortgage debt to value of farm real estate reporting mortgage; for the United States as a whole from 29.1 per cent in 1920 to 41.9 per cent in 1925. This is indeed a startling change. Moreover, it was marked in every geographic section, even in New England and the Middle Atlantic States. In the West North Central group the percentage increased from 26.5 to 44.9; in the single state of Iowa, from 27 per cent to 49.2 per cent.

Thus, while the percentage of farms operated by owners decreased considerably in the major farming areas, the decrease in the percentage of equity owned by the farmers was very much more significant.

### LENDING AGENCIES AS FARM OWNERS

Another important trend in farm ownership is the large amount of land that has been taken over by various lending agencies by either formal or informal processes of foreclosure. No reliable figures are available to show the amount of this great change in the ownership of farm land, but the figures are known to reach a substantial total.

Some of this land is owned by insurance companies, mortgage loan companies, and commercial banks. In some cases the latter class of holders have formed special holding companies so as to get the large real estate holdings off the books of the banks. Information available in the Department of Agriculture shows that to a large extent these various agencies are following a temporary, or makeshift, policy, awaiting the time when the farm land market improves sufficiently to enable them to dispose of their holdings at least at a price sufficient to cover indebtedness. Some are attempting to rent the land to tenants; a few are experimenting with large scale operation (corporation farming or

"chain" farming); still others are making little or no effort to put their holdings into active use.

On the whole, it would not be easy to note the trend in regard to farm ownership in the five years preceding 1925 without deep concern.

It is true that a certain amount of tenancy may be regarded as normal in so far as it furnishes either a stepping stone for the climber or a refuge for the man whose lack of ability unfits him for the larger financial responsibilities and more complete autonomy of farm ownership. In some parts of the country it has also offered an opportunity to the considerable number who deliberately preferred the milder dependent relationship of the tenant to the more exacting and precarious responsibilities of the debtor, particularly where the ratio of rent to the value of farm real estate has been much lower than the rate of interest and premiums on mortgage loans.

It should also be remembered that, on the whole, American landlordism has been a comparatively innocuous type, and in many ways of even a distinctly helpful and constructive character. A sampling study of the landlord class made some five years ago showed that only about one-fourth of the farms rented were owned by those reporting the ownership of more than four rented farms, predominantly in plantation regions; that 80 per cent of the landlords lived in the same county in which the rented farms were located and 91 per cent in the same or an adjoining county; that in the Northern States 37 per cent lived on farms and about two-thirds on farms or in small towns and villages, while in the South more than two-thirds lived on farms and more than four-fifths either on farms or in small towns and villages; that only 8 per cent had never worked on farms; and that nearly two-thirds in the North and 70 per cent in the South were either engaged in agricultural occupations, or retired, or idle.[3] Moreover, the census of 1925 showed that in the states of the North where tenancy is prevalent, from 20 to 40 per cent of the tenants are related to their landlords as children, grandchildren, brothers or sisters.

In spite of all these considerations, the changes of the period 1920–1925 have tended to increase the percentage of tenancy in areas where it was already considered abnormal in amount, and, as we have noted, enormously reduced the percentage of equity of those who continued as owners. Moreover, the large area of farm land which has fallen into the hands of the lending class, to a considerable extent composed of large corporations, has resulted either temporarily or permanently in a type of landlordism which the majority of economists and sociologists would regard as anything but wholesome.

[3] "Farm Ownership and Tenancy," *Yearbook* of United States Department of Agriculture, 1923.

# Trends in Farm Land Values in the United States from 1912 to 1928

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A SURVEY of trends in farm land values over a period of years necessitates, at the outset, a consideration of the nature and the reliability of the data to be employed as factual evidence of such values. It is a relatively simple matter to obtain accurate production and price statistics pertaining to commodities entering into everyday transactions, but it is an exceedingly difficult problem to gather reliable and comparable data which may be employed in analyzing the historic and geographic trends in farm real estate values. At best, such data are based largely on individual estimates of values, which are subject to many personal influences and psychological biases. They can give, therefore, only a very rough approximation of actual trends.

## Estimated Values

Inasmuch as the Bureau of Census estimates of farm land values are not made annually and therefore can be employed to show only long run historic trends, but not year to year changes, the following analysis is based primarily on statistical compilations, made by the Bureau of Agricultural Economics of the United States Department of Agriculture. This Bureau has, since 1912, obtained annual estimates from its crop reporters in different agricultural areas of the average per acre value of (1) all farm lands with improvements (*i.e.*, land and buildings) and (2) all farm lands without improvements. Since 1916 crop reporters are also asked to indicate in their annual reports the average value per acre of good plowlands, poor plowlands, and all plowlands. The most recent (1928) survey is based on replies as to farm real estate values obtained from 50,000 farmers, land dealers and others in all parts of the country.

On the basis of the estimated values per acre of farm lands with buildings, checked wherever possible, against recorded sales prices of farms actually sold, the Bureau has computed a preliminary weighted index of per acre farm real estate values for each state of the Union. This index, corrected from time to time, when new factual data warrants corrections, shows the relative rather than the absolute value changes of per acre farm real estate in different states since 1912. In view of the different value levels in various states, absolute dollar changes cannot serve as a reliable index of the annual relative changes in farm real estate values from state to state. The improved farm real estate value series has been selected to compute this index, since "it represents most closely the way farm land is usually bought and sold—as a unit with improvements included." [1]

To date the Bureau of Agricultural Economics has not recommended to its crop reporters any specific method or methods of farm real estate appraisal. It is left to the judgment of the individual reporters as to what factors they want to consider in making their estimates of farm real estate values. There is no indication of the extent to which

[1] "The Farm Real Estate Situation, 1926–1927," Circular 15, United States Department of Agriculture, p. 33.

they are influenced in their estimates by net cash-rentals of farms in their respective localities.

Theoretically the selling value of farm real estate, as of capital assets in general, is determined by capitalizing net annual rentals at the prevailing rate of interest. There are, however, at present no adequate indices of net rentals of farms throughout the United States available. Furthermore, net earnings, attributable to farm lands, fluctuate considerably from year to year. An increase or a decrease in any one year may not affect farm values at all.

Admitting that net rentals attributable to farm lands over a period of years and prices of farm products are important factors in determining farm real estate values, we must not lose sight of the fact that these in turn are affected by a complex array of influences, such as taxes on farm real estate, conditions of credit, efficiency in farm utilization, weather conditions, markets for farm products and the like. It can scarcely be expected that crop reporters, who are chiefly farmers, should analyze and weigh this complexity of influences affecting, more or less unconsciously, their judgments as to farm real estate values.

Estimates of prevailing values as a rule are based on prevailing sales prices at voluntary sale. Inquiry in the field very clearly establishes that. Also actual sales prices are to an extent built out of estimates. That psychological biases may enter is, of course, obvious, all one can hope for is a rough indication of trend . . . Sales prices are found only in conveyance records of some 2,500 individual agricultural counties. Only a few states assemble sales prices for any purpose. The county records are not uniformly kept. What the deed says cannot be accepted as a statement of fact. Every sale should be "fielded" and verified.[3]

[3] Correspondence with E. W. Wiecking, Associate Agricultural Economist, United States Department of Agriculture, December 8, 1928.

The defects in any statistical compilation employing individual estimates as factual materials, no matter how extensively gathered, should be clearly borne in mind. They are accentuated in the statistics on farm real estate values, compiled by the Bureau of Agricultural Economics, because the crop reporters volunteer their information, their personnel changes from year to year, and the opinions which they express pertain to average values per acre of improved and unimproved farm lands which "is at best an unknown and shifting composite of all sorts of kinds and qualities of real estate." [3]

## EXPANSION IN CULTIVATED FARM LANDS

Per acre farm real estate values, moreover, are affected by shifts in the total acreage in farms. A large increase in farm acreage in any geographic area may increase the total farm land values, but decrease per acre values. Thus it becomes necessary to allow for shifts in total area in farm lands under cultivation before accepting the per acre index as a reliable indicator of actual trends in farm real estate values.

Although in many of the Southern and Mid-Western States the area of cultivated farm lands has contracted since 1920, in others there has been a substantial expansion in acreage. The crop areas in Texas increased 5,000,000 acres during the three-year period 1925–1927 as compared with the three-year period 1919–1921, North Dakota and Nebraska contributed about 1,000,000 acres each and Kansas, South Dakota and Oklahoma another million acres.[4]

There has also been a considerable expansion in cultivated farm lands in

[3] *Ibid.*

[4] W. M. Jardine, Secretary of Agriculture, in "Financial and Business Survey," *Philadelphia Public Ledger*, January 2, 1929.

the Rocky Mountain States in recent years. Table I shows the changes in farm land areas in different geographic divisions between 1920 and 1925, based on census compilations.

TABLE I—CHANGES IN ACREAGE OF ALL LAND IN FARMS BY GEOGRAPHIC DIVISIONS *

| Divisions | Increase or Decrease, 1925 over 1920 | |
|---|---|---|
| | Number of Acres | Per Cent |
| United States | −31,564,362 | − 3.3 |
| Geographic Divisions: | | |
| New England | − 1,132,715 | − 6.7 |
| Middle Atlantic | − 3,081,962 | − 7.6 |
| East North Central | − 4,982,721 | − 4.2 |
| West North Central | − 8,892,086 | − 3.5 |
| South Atlantic | − 9,205,785 | − 9.4 |
| East South Central | − 8,290,838 | −10.5 |
| West South Central | − 8,435,811 | − 4.9 |
| Mountain | +14,352,148 | +12.2 |
| Pacific | − 1,894,593 | − 3.4 |

* "The Recent Recession of Farm Population and Farm Land," in *Journal of Land and Public Utility Economics*, Vol. IV, No. 1, February, 1928, p. 52.

On the other hand, a contraction in cultivated farm acreage as witnessed largely in the Eastern and Southern States during the past years, due to foreclosures and abandonment of farms, may tend to increase estimates of per acre farm real estate values, although decreasing total farm values, since usually the poorer grades of farms have been abandoned. But both per acre and total farm real estate values may be depressed when forced sales so increase the supply of available farms in a certain area as to make them a drug on the market.

Again differences in areas reported and differences in weighting the "samples" employed in preparing indices may give very different results. Numerous instances of variations in historic trends in per acre farm real estate values as reported in State Agricultural Bulletins and as contained in the compilations by the Bureau of Agricultural Economics, respectively, might be cited. All such compilations, since they are based primarily on individual estimates, "may be taken as rough indices of change, but should not be taken as too closely expressing actual acreage values." [5]

The index of estimated per acre farm real estate values computed by the Bureau of Agricultural Economics, furthermore, combines the estimated values of farm lands and of farm buildings. Since crop reporters and correspondents are also asked to report the values of farm lands without buildings, it is possible to obtain an approximate idea of the proportion which farm building values represent of the total farm real estate values. If this proportion were the same per acre of farm real estate throughout the country, the farm real estate value index might serve also as an indicator of farm land values. But it varies considerably from locality to locality, as is indicated in the accompanying table.

TABLE II—ESTIMATED FARM BUILDING VALUES AS PER CENT OF FARM REAL ESTATE VALUES, 1925 *

| Divisions and States | Per Cent |
|---|---|
| New England States | 54.3 |
| Middle Atlantic States | 52.4 |
| East North Central States | 27.7 |
| West North Central States | 19.5 |
| South Atlantic States | 27.3 |
| East South Central States | 26.3 |
| West South Central States | 15.8 |
| Mountain States | 15.4 |
| Pacific States | 13.7 |
| United States | 23.7 |

* Circular 15, United States Department of Agriculture, p. 40.

[5] Bulletin 445, Pennsylvania Federal State Crop Reporting Service, p. 221.

In recent years increasing costs of farm building construction and possibly inadequate allowance for building depreciation on the one hand, and decreasing farm real estate values on the other hand, have raised the proportion of estimated farm building values to total values over that of 1920. In the large agricultural areas of the United States farm buildings at present are estimated to represent from 10 to 25 per cent of the total farm values, but the proportion of building to total values is considerably higher in the Northeastern States.

Thus the index of estimated farm real estate values may be employed to indicate the general trends in farm land values, but the relative importance of farm building values in this index, both historically and geographically, should not be lost sight of.

Finally, it should be noted that the index of farm real estate values is based on estimates made in terms of current dollars. It has not been corrected for changes in the value of the dollar since 1912. It thus serves as an indicator of the changes in the nominal value of the farmers' or farm owners' capital investment in farm real estate, representing between two-thirds and four-fifths of the average farmer's total capital investment.[6] But it does not indicate the changes in its real value. To note these changes it becomes necessary to correct the farm real estate value index for price changes in general. This raises the question as to the suitable index of prices to be employed to make such "corrections."

## INDEX OF FARM REAL ESTATE VALUES

In the following analysis the United States Bureau of Labor Statistics Wholesale Commodity Price Index rather than the indices of the prices of either agricultural or non-agricultural products has been used, since the nominal value of the farmer's capital investment in his farm is measured in dollars which have general purchasing power, and since it is difficult to determine to what extent the demand for farm real estate is influenced by the prices received for agricultural products rather than by the purchasing power derived from the sale of non-agricultural products.

All of the foregoing considerations should be borne in mind in interpreting the index of per acre farm real estate values, prepared by the Bureau of Agricultural Economics. Too frequently statistical compilations made by public agencies,—commonly called official statistics,—are accepted as factual evidence with a degree of unwarranted finality, even in supposedly scientific treatises. To guard against such errors it was deemed advisable to examine into the nature and composition of the index of farm real estate values, and to note some of its limitations as a reliable index of trends in actual farm land values in the United States, before employing it as evidence of such trends.

The Index (Table III) shows, in a general way, the profound changes in farm real estate values in different parts of the United States during the past fifteen years. The extent of these changes, however, has varied from year to year and from locality to locality in accordance with the peculiar economic influences affecting the utilization of farm lands in different parts of the country. The variations in the historical trends are indicated in the accompanying charts.

*New England States.*—Per acre farm real estate values in the New England States (Chart I) in 1920 rose only 40 per cent over the 1912–1914 average level. On the other hand, the whole-

[6] Approximately 60 per cent of the farms in the United States are operated by their owners.

TABLE III*—FARM REAL ESTATE: AN INDEX NUMBER OF ESTIMATED VALUE PER ACRE, BY GEOGRAPHIC DIVISIONS AND STATES, 1912–1928†

(1912, 1913, 1914 = 100 per cent)

| Geographic Division and State | 1912 | 1913 | 1914 | 1915 | 1916 | 1917 | 1918 | 1919 | 1920 | 1921 | 1922 | 1923 | 1924 | 1925 | 1926 | 1927 | 1928 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| United States | 97 | 100 | 103 | 103 | 108 | 117 | 129 | 140 | 170 | 157 | 139 | 135 | 130 | 127 | 124 | 119 | 117 |
| Geographic divisions: | | | | | | | | | | | | | | | | | |
| New England | 99 | 101 | 100 | 99 | 102 | 112 | 117 | 123 | 140 | 135 | 134 | 130 | 128 | 127 | 128 | 127 | 127 |
| Middle Atlantic | 98 | 100 | 102 | 100 | 104 | 112 | 117 | 121 | 136 | 127 | 118 | 116 | 114 | 114 | 113 | 111 | 110 |
| East North Central | 97 | 100 | 103 | 103 | 110 | 116 | 127 | 135 | 161 | 151 | 132 | 128 | 121 | 116 | 111 | 104 | 101 |
| West North Central | 97 | 100 | 103 | 105 | 114 | 122 | 134 | 147 | 184 | 174 | 150 | 142 | 132 | 126 | 121 | 115 | 113 |
| South Atlantic | 98 | 100 | 103 | 98 | 108 | 119 | 135 | 161 | 198 | 174 | 146 | 152 | 151 | 148 | 149 | 137 | 134 |
| East South Central | 97 | 100 | 103 | 99 | 109 | 120 | 140 | 162 | 199 | 163 | 149 | 149 | 142 | 141 | 139 | 133 | 130 |
| West South Central | 96 | 100 | 104 | 100 | 103 | 116 | 134 | 143 | 177 | 159 | 136 | 132 | 136 | 144 | 144 | 139 | 137 |
| Mountain | 98 | 102 | 100 | 98 | 98 | 106 | 117 | 130 | 151 | 133 | 122 | 115 | 110 | 105 | 103 | 101 | 101 |
| Pacific | 94 | 99 | 106 | 107 | 111 | 122 | 129 | 134 | 156 | 155 | 151 | 148 | 147 | 146 | 144 | 143 | 142 |
| New England: | | | | | | | | | | | | | | | | | |
| Maine | 100 | 102 | 98 | 96 | 98 | 110 | 115 | 124 | 142 | 132 | 127 | 129 | 127 | 124 | 126 | 124 | 124 |
| New Hampshire | 97 | 101 | 102 | 101 | 98 | 103 | 111 | 116 | 129 | 123 | 126 | 111 | 109 | 111 | 113 | 112 | 112 |
| Vermont | 101 | 101 | 98 | 104 | 115 | 127 | 133 | 136 | 150 | 150 | 145 | 134 | 130 | 125 | 126 | 125 | 123 |
| Massachusetts | 98 | 100 | 102 | 98 | 100 | 110 | 114 | 119 | 140 | 134 | 134 | 132 | 131 | 132 | 134 | 131 | 131 |
| Rhode Island | 100 | 101 | 100 | 102 | 106 | 112 | 118 | 123 | 130 | 130 | 127 | 124 | 126 | 128 | 130 | 133 | 134 |
| Connecticut | 98 | 100 | 102 | 100 | 102 | 110 | 116 | 121 | 137 | 134 | 140 | 137 | 140 | 137 | 137 | 138 | 139 |
| Middle Atlantic: | | | | | | | | | | | | | | | | | |
| New York | 98 | 100 | 102 | 100 | 103 | 109 | 115 | 118 | 133 | 123 | 116 | 115 | 112 | 111 | 109 | 108 | 106 |
| New Jersey | 98 | 100 | 102 | 100 | 102 | 111 | 115 | 119 | 130 | 130 | 121 | 115 | 120 | 124 | 129 | 128 | 127 |
| Pennsylvania | 98 | 100 | 102 | 100 | 105 | 114 | 119 | 124 | 140 | 131 | 120 | 118 | 116 | 114 | 114 | 112 | 111 |
| East North Central: | | | | | | | | | | | | | | | | | |
| Ohio | 98 | 100 | 102 | 107 | 113 | 119 | 131 | 135 | 159 | 134 | 124 | 122 | 118 | 110 | 105 | 99 | 96 |
| Indiana | 98 | 100 | 102 | 101 | 110 | 116 | 128 | 135 | 161 | 147 | 119 | 115 | 108 | 102 | 95 | 87 | 84 |
| Illinois | 97 | 100 | 103 | 102 | 105 | 111 | 119 | 130 | 160 | 153 | 126 | 123 | 116 | 115 | 109 | 99 | 96 |
| Michigan | 98 | 99 | 103 | 105 | 111 | 120 | 134 | 137 | 154 | 152 | 148 | 145 | 138 | 133 | 129 | 127 | 125 |
| Wisconsin | 97 | 100 | 103 | 104 | 117 | 124 | 133 | 143 | 171 | 168 | 154 | 147 | 139 | 130 | 125 | 122 | 120 |
| West North Central: | | | | | | | | | | | | | | | | | |
| Minnesota | 95 | 100 | 105 | 107 | 122 | 138 | 155 | 167 | 213 | 212 | 187 | 177 | 170 | 159 | 155 | 145 | 140 |
| Iowa | 96 | 99 | 104 | 112 | 128 | 134 | 145 | 160 | 213 | 197 | 162 | 156 | 143 | 136 | 130 | 121 | 117 |
| Missouri | 97 | 100 | 103 | 102 | 108 | 115 | 125 | 137 | 167 | 156 | 133 | 127 | 117 | 112 | 104 | 99 | 96 |
| North Dakota | 97 | 100 | 103 | 103 | 112 | 118 | 124 | 130 | 145 | 141 | 136 | 128 | 114 | 109 | 105 | 100 | 99 |
| South Dakota | 96 | 101 | 103 | 101 | 108 | 116 | 126 | 145 | 181 | 173 | 146 | 126 | 117 | 115 | 107 | 97 | 96 |
| Nebraska | 98 | 100 | 102 | 101 | 104 | 110 | 127 | 145 | 179 | 166 | 144 | 139 | 128 | 123 | 123 | 119 | 117 |
| Kansas | 101 | 99 | 99 | 103 | 109 | 115 | 122 | 132 | 151 | 149 | 130 | 127 | 118 | 115 | 113 | 113 | 113 |
| South Atlantic: | | | | | | | | | | | | | | | | | |
| Delaware | 100 | 101 | 99 | 100 | 105 | 115 | 124 | 129 | 139 | 129 | 119 | 119 | 107 | 112 | 114 | 111 | 111 |
| Maryland | 97 | 100 | 103 | 104 | 109 | 118 | 129 | 136 | 166 | 146 | 141 | 136 | 133 | 131 | 130 | 126 | 124 |
| Virginia | 97 | 100 | 103 | 97 | 117 | 125 | 142 | 167 | 189 | 180 | 157 | 170 | 162 | 154 | 148 | 138 | 137 |
| West Virginia | 97 | 100 | 103 | 101 | 104 | 112 | 122 | 135 | 154 | 141 | 125 | 127 | 125 | 120 | 116 | 110 | 109 |
| North Carolina | 97 | 99 | 104 | 102 | 114 | 130 | 152 | 176 | 223 | 196 | 166 | 195 | 192 | 187 | 185 | 178 | 174 |
| South Carolina | 101 | 98 | 101 | 94 | 98 | 107 | 122 | 162 | 230 | 186 | 126 | 128 | 136 | 138 | 128 | 113 | 110 |
| Georgia | 98 | 101 | 101 | 94 | 105 | 116 | 131 | 172 | 217 | 172 | 136 | 125 | 123 | 116 | 112 | 104 | 102 |
| Florida | 96 | 99 | 105 | 97 | 103 | 109 | 126 | 143 | 178 | 176 | 157 | 155 | 163 | 172 | 223 | 183 | 176 |
| East South Central: | | | | | | | | | | | | | | | | | |
| Kentucky | 97 | 100 | 103 | 100 | 111 | 127 | 146 | 170 | 200 | 172 | 151 | 147 | 141 | 140 | 139 | 134 | 130 |
| Tennessee | 96 | 100 | 104 | 100 | 110 | 121 | 145 | 168 | 200 | 169 | 154 | 158 | 148 | 137 | 134 | 130 | 127 |
| Alabama | 98 | 98 | 103 | 98 | 98 | 103 | 128 | 143 | 177 | 147 | 135 | 143 | 144 | 154 | 154 | 145 | 145 |
| Mississippi | 97 | 102 | 102 | 97 | 111 | 121 | 131 | 155 | 218 | 150 | 148 | 143 | 134 | 136 | 134 | 126 | 123 |
| West South Central: | | | | | | | | | | | | | | | | | |
| Arkansas | 98 | 101 | 101 | 95 | 109 | 129 | 149 | 169 | 222 | 186 | 174 | 170 | 160 | 160 | 153 | 150 | 147 |
| Louisiana | 99 | 102 | 99 | 95 | 106 | 112 | 143 | 157 | 198 | 163 | 140 | 144 | 137 | 141 | 143 | 135 | 132 |
| Oklahoma | 98 | 101 | 101 | 95 | 104 | 114 | 130 | 140 | 166 | 160 | 139 | 133 | 125 | 131 | 130 | 128 | 127 |
| Texas | 95 | 100 | 105 | 103 | 103 | 115 | 133 | 141 | 174 | 156 | 133 | 128 | 137 | 146 | 146 | 141 | 139 |
| Mountain: | | | | | | | | | | | | | | | | | |
| Montana | 97 | 100 | 103 | 100 | 94 | 100 | 106 | 114 | 126 | 105 | 96 | 87 | 81 | 75 | 72 | 70 | 71 |
| Idaho | 100 | 101 | 99 | 96 | 99 | 114 | 130 | 146 | 172 | 162 | 136 | 133 | 129 | 123 | 119 | 117 | 116 |
| Wyoming | 97 | 103 | 100 | 103 | 94 | 97 | 121 | 147 | 176 | 146 | 134 | 121 | 112 | 100 | 95 | 94 | 95 |
| Colorado | 98 | 103 | 98 | 93 | 102 | 107 | 110 | 118 | 141 | 132 | 123 | 113 | 98 | 92 | 89 | 82 | 82 |
| New Mexico | 100 | 104 | 96 | 100 | 96 | 111 | 118 | 127 | 144 | 125 | 115 | 110 | 110 | 108 | 106 | 108 | 108 |
| Arizona | 95 | 100 | 105 | 97 | 95 | 105 | 125 | 140 | 165 | 148 | 135 | 124 | 128 | 121 | 125 | 123 | 122 |
| Utah | 100 | 102 | 98 | 98 | 104 | 117 | 122 | 144 | 167 | 137 | 133 | 133 | 131 | 130 | 129 | 128 | 127 |
| Nevada | 96 | 100 | 103 | 102 | 99 | 96 | 103 | 117 | 135 | 123 | 119 | 112 | 108 | 102 | 99 | 99 | 99 |
| Pacific: | | | | | | | | | | | | | | | | | |
| Washington | 98 | 100 | 103 | 100 | 102 | 112 | 118 | 122 | 140 | 132 | 124 | 117 | 115 | 113 | 112 | 111 | 110 |
| Oregon | 97 | 100 | 103 | 99 | 100 | 104 | 112 | 118 | 130 | 130 | 122 | 115 | 113 | 110 | 107 | 106 | 106 |
| California | 93 | 99 | 108 | 111 | 116 | 130 | 136 | 142 | 167 | 168 | 166 | 165 | 164 | 164 | 163 | 162 | 161 |

* Circular 60, United States Department of Agriculture, "The Farm Real Estate Situation, 1927–1928," p. 9.

† All farm land with improvements, as of March 1. Corrections for certain years have been made in earlier figures published for Wisconsin and Georgia, the East North Central, South Atlantic and East South Central divisions, and the United States. Owing to rounding of figures, 1912–1914 will not always equal exactly 100 per cent.

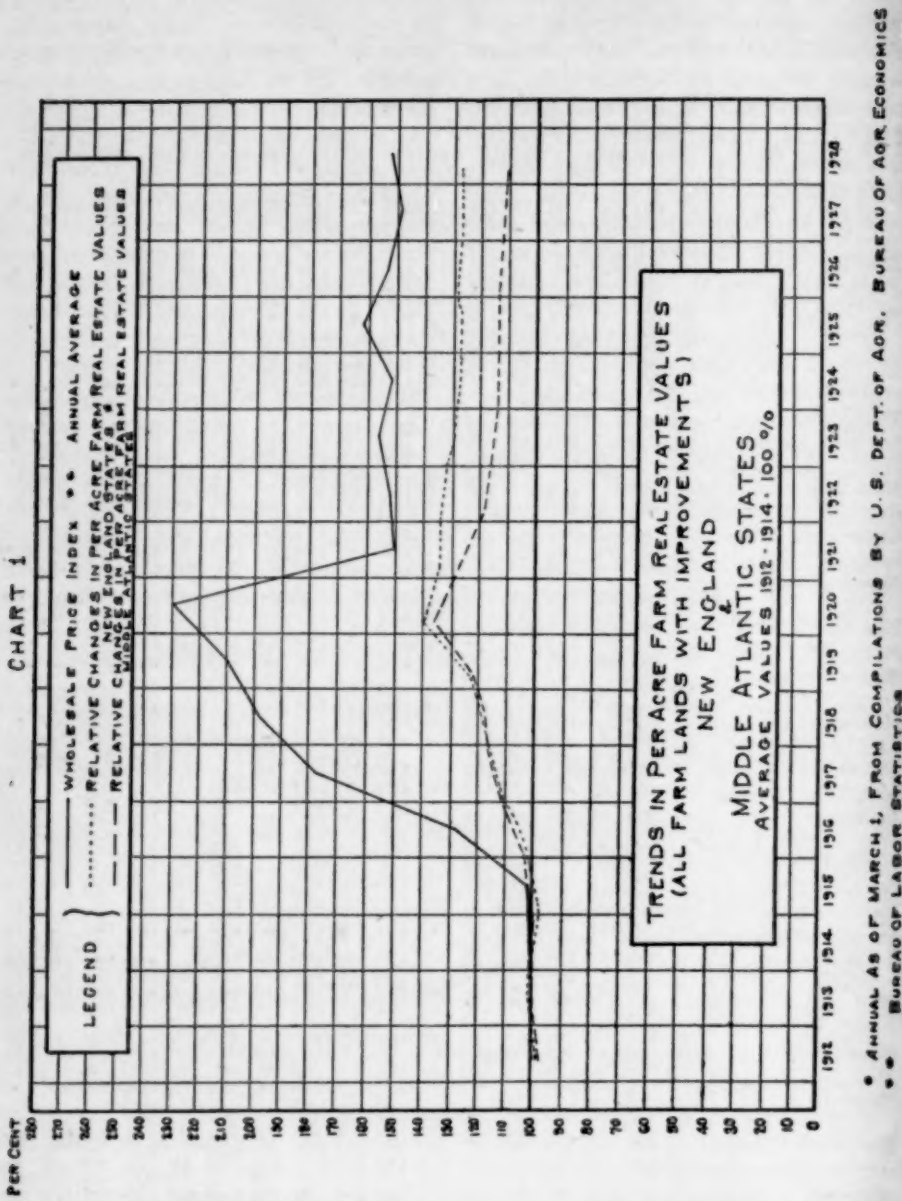
CHART 1
TRENDS IN PER ACRE FARM REAL ESTATE VALUES
(ALL FARM LANDS WITH IMPROVEMENTS)
NEW ENGLAND
&
MIDDLE ATLANTIC STATES
AVERAGE VALUES 1912-1914=100 %
LEGEND
WHOLESALE PRICE INDEX ** ANNUAL AVERAGE
RELATIVE CHANGES IN PER ACRE FARM REAL ESTATE VALUES
NEW ENGLAND STATES *
RELATIVE CHANGES IN PER ACRE FARM REAL ESTATE VALUES
MIDDLE ATLANTIC STATES *
PER CENT
1912 1913 1914 1915 1916 1917 1918 1919 1920 1921 1922 1923 1924 1925 1926 1927 1928
* ANNUAL AS OF MARCH 1, FROM COMPILATIONS BY U. S. DEPT. OF AGR. BUREAU OF AGR. ECONOMICS
** BUREAU OF LABOR STATISTICS

sale commodity price index advanced no less than 130 per cent during the same interval. In other words, New England farm values were apparently not "inflated" in 1920 to the extent that the general level of commodity prices was "inflated." They were not even adjusted to the higher level of prices, and, in consequence, their values in terms of dollars of "constant" purchasing power were less in 1920 than in 1913.

Since 1920, there has, therefore, been relatively little "deflation" in farm real

estate values in the New England States. Whereas the wholesale commodity price index has declined approximately 34 per cent since 1920, New England farm real estate values have declined 9.3 per cent during the same interval (Table IV).

In terms of dollars of constant purchasing power New England farm real estate values in 1928 were on an average of 16.5 per cent below the pre-war level, but the 1928 corrected index stood 22.5 per cent higher than in 1920.

In Rhode Island the index of nominal farm real estate values actually rose 3 per cent since 1920, and in Connecticut 1 per cent. These are the only two states in the Union in which the nominal value of farm real estate has risen during the past eight years, according to the Bureau of Agricultural Economics Index.

A number of factors have contributed toward this relative stability in New England farm values during the past fifteen years. There was little

TABLE IV—CHANGES IN AVERAGE PER ACRE FARM REAL ESTATE VALUES, 1920–1928

| State and Division | 1920 | 1928 | Change (Per Cent) |
|---|---|---|---|
| Maine | 142 | 124 | −12.7 |
| New Hampshire | 129 | 112 | −13.2 |
| Vermont | 150 | 123 | −12.0 |
| Massachusetts | 140 | 131 | − 6.4 |
| Rhode Island | 130 | 134 | + 3.0 |
| Connecticut | 137 | 139 | + 1.0 |
| New England | 140 | 127 | − 9.3 |
| New York | 133 | 106 | −20.3 |
| New Jersey | 130 | 127 | − 2.3 |
| Pennsylvania | 140 | 111 | −20.3 |
| Middle Atlantic | 136 | 110 | −19.1 |
| Delaware | 139 | 111 | −20.1 |
| Maryland | 166 | 124 | −25.3 |
| Virginia | 189 | 137 | −27.5 |
| West Virginia | 154 | 109 | −29.3 |
| North Carolina | 223 | 174 | −22.0 |
| South Carolina | 230 | 110 | −52.2 |
| Georgia | 217 | 102 | −53.0 |
| South Atlantic | 198 | 134 | −32.3 |
| Ohio | 159 | 96 | −39.6 |
| Indiana | 161 | 84 | −47.8 |
| Illinois | 160 | 96 | −40.0 |
| Michigan | 154 | 125 | −18.8 |
| Wisconsin | 171 | 120 | −30.0 |
| East North Central | 161 | 101 | −37.7 |
| Minnesota | 213 | 140 | −34.3 |
| Iowa | 213 | 117 | −45.1 |
| Missouri | 167 | 96 | −42.3 |
| North Dakota | 145 | 99 | −31.7 |
| South Dakota | 181 | 96 | −47.0 |
| Nebraska | 179 | 117 | −34.6 |
| Kansas | 151 | 113 | −25.2 |
| West North Central | 184 | 113 | −38.6 |
| Kentucky | 200 | 130 | −35.0 |
| Tennessee | 200 | 127 | −36.5 |
| Alabama | 177 | 145 | −18.8 |
| Mississippi | 218 | 123 | −43.6 |
| East South Central | 199 | 130 | −34.7 |
| Louisiana | 198 | 132 | −33.3 |
| Texas | 174 | 139 | −20.1 |
| Oklahoma | 166 | 127 | −23.5 |
| Arkansas | 222 | 147 | −33.8 |
| West South Central | 177 | 137 | −22.6 |
| Montana | 126 | 71 | −43.7 |
| Wyoming | 176 | 95 | −46.6 |
| Colorado | 141 | 82 | −41.8 |
| New Mexico | 144 | 108 | −25.0 |
| Arizona | 165 | 122 | −26.1 |
| Utah | 167 | 127 | −24.0 |
| Nevada | 135 | 99 | −26.7 |
| Idaho | 172 | 116 | −32.6 |
| Mountain | 151 | 101 | −33.1 |
| Washington | 140 | 110 | −21.4 |
| Oregon | 130 | 106 | −18.5 |
| California | 167 | 161 | − 3.6 |
| Pacific | 156 | 142 | − 9.0 |
| United States | 170 | 117 | −31.7 |
| Wholesale Price Index Annual Average | 230 | 152 | −34.0 |

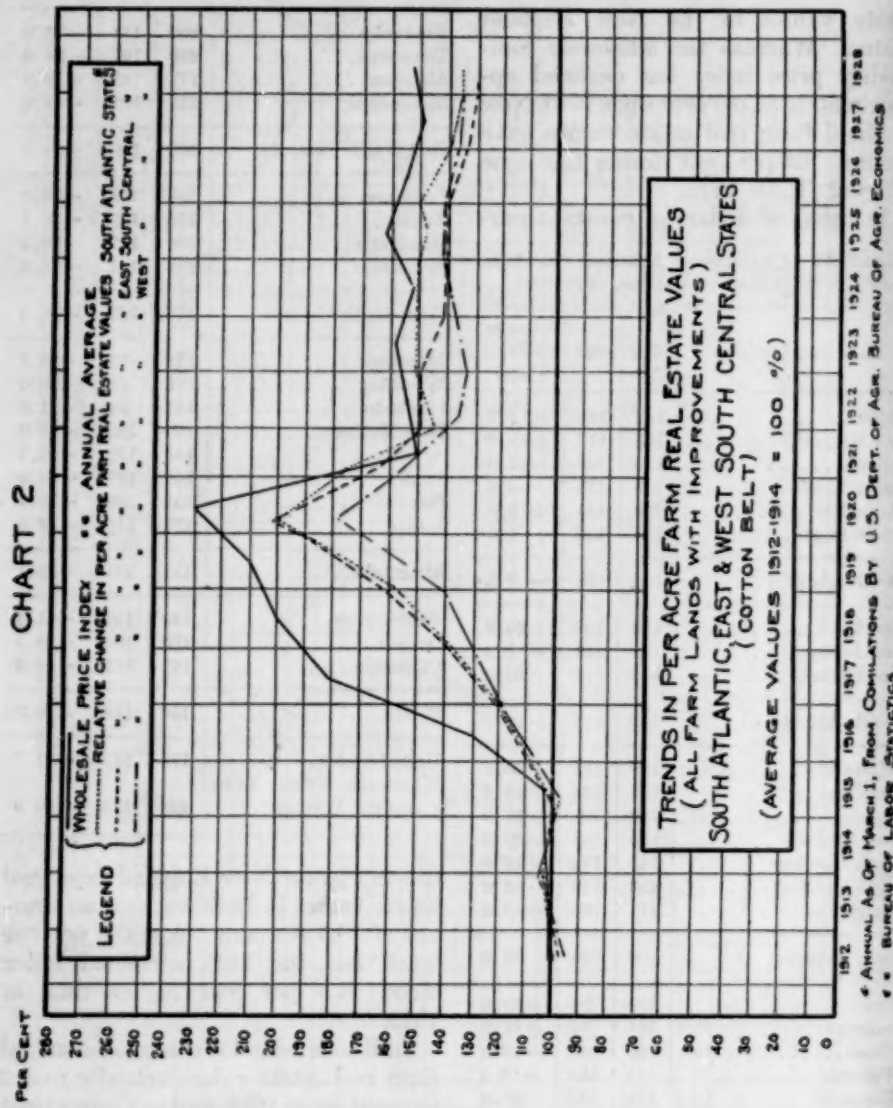
CHART 2
TRENDS IN PER ACRE FARM REAL ESTATE VALUES
(ALL FARM LANDS WITH IMPROVEMENTS)
SOUTH ATLANTIC, EAST & WEST SOUTH CENTRAL STATES
(COTTON BELT)
(AVERAGE VALUES 1912-1914 = 100 %)
LEGEND
WHOLESALE PRICE INDEX
ANNUAL AVERAGE RELATIVE CHANGE IN PER ACRE FARM REAL ESTATE VALUES SOUTH ATLANTIC STATES
EAST SOUTH CENTRAL
WEST
PER CENT
280 270 260 250 240 230 220 210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
1912 1913 1914 1915 1916 1917 1918 1919 1920 1921 1922 1923 1924 1925 1926 1927 1928
* ANNUAL AS OF MARCH 1, FROM COMPILATIONS BY U.S. DEPT. OF AGR. BUREAU OF AGR. ECONOMICS
** BUREAU OF LABOR STATISTICS.

speculative activity in New England farms prior to 1920, and anticipated larger future incomes from farm lands were negligible as an influence affecting farm values. Since 1920 the well sustained prices of dairy and poultry products have helped to stabilize farm incomes and farm values.

The prices of potatoes, although showing a sharp break in 1928, were well above the pre-war prices in 1925, 1926 and 1927. A liberal diversification of crops, improvement in country roads and proximity to marketing centers have all contributed toward stability in New England farm land values in recent years.

*Middle Atlantic States.*—Farm real estate values in the Middle Atlantic States (Chart I) did not even rise as high

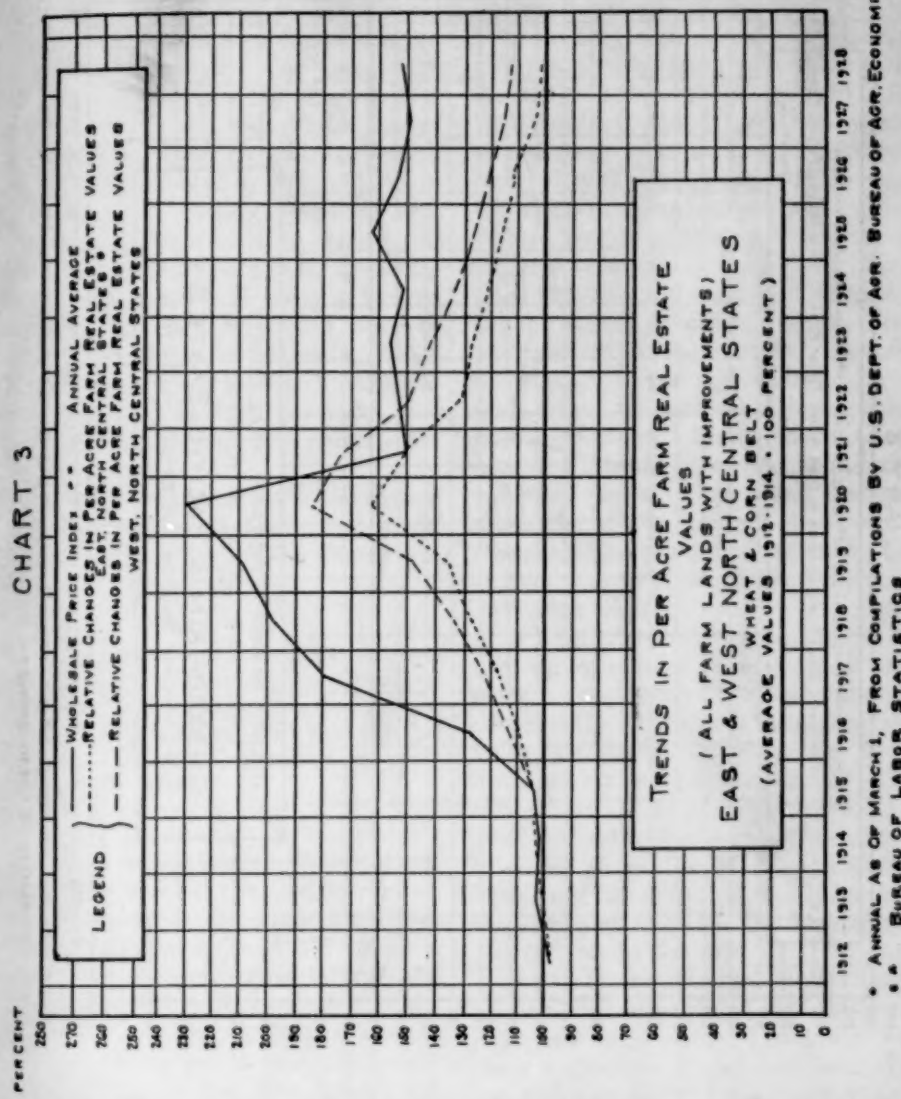
CHART 3
TRENDS IN PER ACRE FARM REAL ESTATE VALUES
(ALL FARM LANDS WITH IMPROVEMENTS)
EAST & WEST NORTH CENTRAL STATES
WHEAT & CORN BELT
(AVERAGE VALUES 1912-1914 = 100 PERCENT)
LEGEND
WHOLESALE PRICE INDEX * ANNUAL AVERAGE
RELATIVE CHANGES IN PER ACRE FARM REAL ESTATE VALUES NORTH CENTRAL STATES **
RELATIVE CHANGES IN PER ACRE FARM REAL ESTATE VALUES WEST NORTH CENTRAL STATES
PER CENT
* ANNUAL AS OF MARCH 1, FROM COMPILATIONS BY U.S. DEPT. OF AGR. BUREAU OF AGR. ECONOMICS
** BUREAU OF LABOR STATISTICS

as those in New England in 1920. But the decline since then has been somewhat more pronounced, aggregating 19.1 per cent. Most of this decline, however, occurred prior to 1922. Since then the index has dropped on an average of only 1 per cent annually.

The influences which made for stability in farm land values in the New England States in recent years were likewise present, more or less, in the Middle Atlantic States. The value of the farmers' investment in farm real estate, however, when expressed in terms of constant dollars, was 28 per cent less in 1928 than in pre-war years, but had risen 12 points since 1920. In general it may be observed that there

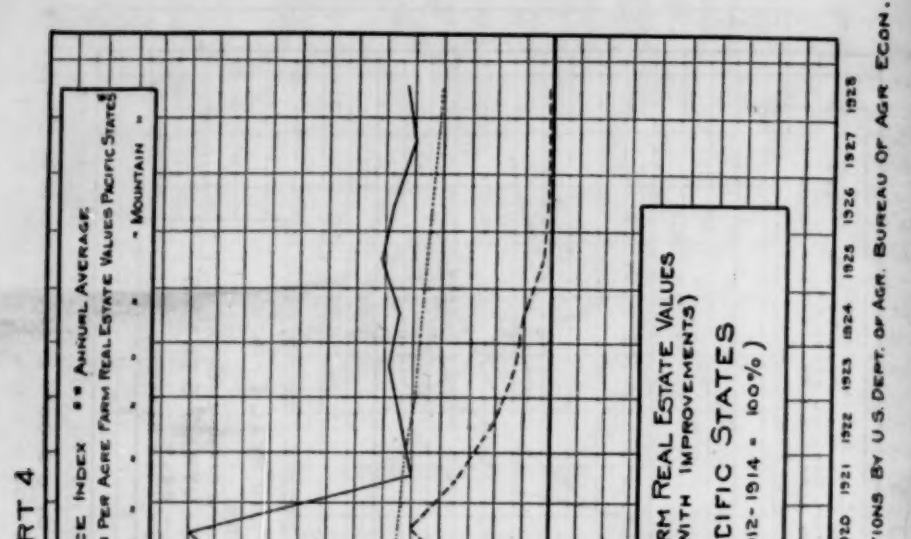
CHART 4
LEGEND
Wholesale Price Index
Annual Average
Relative Changes in Per Acre Farm Real Estate Values Pacific States
" " " " " " Mountain "
TRENDS IN PER ACRE FARM REAL ESTATE VALUES
(ALL FARM LANDS WITH IMPROVEMENTS)
MOUNTAIN & PACIFIC STATES
(AVERAGE VALUES 1912-1914 = 100%)
PER CENT
1912 1913 1914 1915 1916 1917 1918 1919 1920 1921 1922 1923 1924 1925 1926 1927 1928
* ANNUAL AS OF MARCH 1, FROM COMPILATIONS BY U.S. DEPT. OF AGR. BUREAU OF AGR. ECON.
** BUREAU OF LABOR STATISTICS

has been a shrinkage of between one-fifth and one-fourth in the real value of the farm owners' capital investment in farm real estate throughout the North Atlantic States in the past fifteen years, but a pronounced appreciation in its real value since 1920.

*Southern States.*—A somewhat different trend in farm values than that observed in the North Eastern States is to be noted in the Southern States (Chart II). In the South Atlantic States average farm real estate values in 1920 had risen 98 per cent over the pre-war level, and in the East South Central States, 97 per cent. Although showing a downward trend since then, they have remained at a relatively high

level during the past six years. Florida farm real estate values showed a trend distinctly different from that displayed in the Cotton Belt. The speculative "boom" in Florida urban real estate in 1926 also affected many rural areas. Consequently the farm real estate value index rose from 178 in 1920 to 223 in 1926. Selling prices of real estate in Florida in 1926 were influenced far more by profit-taking and by anticipated future increases in income than by possibly prevailing rates of income on farm investments. Since 1926 the opposite tendency has been manifest, and in 1928 the index had declined to 176, only one point below the 1920 level.

In other Southern States the change in the price of cotton has been the chief contributing factor to the changes in farm real estate values.

Farm real estate values in the South maintained relatively high levels compared with the 1920 peak under the stimulus of relatively high post-war cotton prices, markedly above those which prevailed for any of the other major agricultural products of the country.[7]

But during the past two years this favorable situation in the cotton-growing states has changed somewhat. Cotton and cotton-seed prices, which in 1925 showed an index of 177 (pre-war level 100), declined to 122 in 1926 and to 128 in 1927. Although recovering considerably during the first six months of 1928, cotton prices were still nearly 25 points below the 1925 index. On the other hand, higher farm taxes, higher interest rates and other increased costs have tended to diminish the margin of net income from farm lands in the cotton area during the past few years. The depressing effect of these influences upon farm land values has been very apparent.

In South Carolina and Georgia the trend in nominal farm values has been distinctly downward since 1920. In 1928 South Carolina farm real estate values were on an average of 52.2 per cent below the 1920 peak, and Georgia values had declined 53 per cent. The decline was considerably in excess of the decline in the wholesale price index since 1920 (34 per cent) and, contrary to the trend in farm land values in the other South Atlantic States, showed a shrinkage in the real value of farm real estate investments during the past eight years. Many contributing causes of this abnormal decline in farm values in South Carolina and Georgia might be cited, such as boll-weevil ravages, Negro exodus to industrial centers, impaired credit facilities and increasing taxes.

In Kentucky the low selling prices of tobacco, the chief cash crop of the state, have been the outstanding cause of the slump in farm real estate values since 1920. This decline, however, has not been as pronounced as in either South Carolina or Georgia. In addition to the slump in cotton prices in recent years, the Mississippi floods have contributed to depress still further the farm land values in the Mississippi Valley States since 1926.

The West South Central States show a more wholesome trend both prior to 1920 and since then. The index for these states rose 77 per cent over the pre-war level in 1920 and stood 37 per cent above the pre-war average in 1928. Texas farm land values were slightly higher in 1928 than in 1924. "As a whole, land values of this state are now in a healthy condition with a natural tendency to increase on account of the increase in the population of the state."[8]

[7] Circular 15, United States Department of Agriculture, "The Farm Real Estate Situation, 1926–1927," p. 10.

[8] Correspondence, Comptroller of Public Accounts, Austin, Texas, November 26, 1928.

Viewed in terms of "constant" dollars, average per acre farm real estate values in the South Atlantic and East South Central States, in 1920, were approximately 14 per cent below the pre-war level, in spite of their so-called "inflation" in terms of nominal values. During the past eight years the average decline in farm land values in these states has been nearly equal to the decline in the wholesale commodity price index. Thus the real value of farm real estate in the Southeastern States, based on the Bureau of Agricultural Economics Index, has changed very little since 1920, although showing a decline of about 14 per cent since 1913. In the West South Central States real farm values declined 23 per cent from 1913 to 1920, but since then the index has risen 13 points. The real value of the capital investment in farm real estate in these states, however, was 10 per cent less in 1928 than in 1913.

*East and West North Central States.*—Turning now to the wheat and corn belts,—the East and West North Central States (Chart III),—we note that the rise in values until 1920 was as pronounced as in most of the cotton states. Rising war-time and post-war prices of basic agricultural products were capitalized into higher farm land values. Many farmers employed the large profits, realized on the sale of their products, to invest in more farm lands.

It is also likely that the farmers who bought and sold land, instead of being skeptical of the soundness of the high land incomes prevailing in 1920 and the preceding years, were made unduly optimistic by these high incomes and the great increases during the war years, so that they were willing to pay higher prices for land than they would normally have felt justified in doing.[9]

[9] Bulletin 1224, United States Department of Agriculture, "Relation of Land Income to Land Value," p. 23.

Moreover, much farm real estate was bought and sold in 1919 and 1920 in many Mid-Western States, with a view to reselling it at a profit. Many farmers became land speculators. Investigating the motives of buyers of farms in Iowa in 1920, the United States Department of Agriculture discovered that out of 986 purchases where the intentions of the buyers were made known, 224 purchases were made with a view to reselling, while 449 purchases, or only about one-half of the total, were made with a view to operating the farms. On the other hand, an examination of the motives for sale of farms revealed the fact that of a total of 919 cases, 276 or 30 per cent of the sales were made to realize speculative profits.[10]

No doubt similar speculative activities in farm real estate prevailed in the wheat and corn belts in other states, to a greater or less degree, in 1919 and 1920. Anticipated future increases in prices of products, based in part on past experiences, were discounted and capitalized into market values of farm real estate during the war-time and post-war periods. This is indicated by the fact that prior to 1920 farm land values rose more rapidly than net farm income. In other words, the rates at which farm incomes were capitalized into farm land values showed a distinct downward trend.

*Mid-Western States.*—With the sudden slump in prices of basic farm products in 1921 and pronounced price fluctations in subsequent years, on the one hand, and the continued high costs in the form of relatively high wages to hired labor, heavy interest obligations and taxes assessed against "inflated" selling values, on the other hand, farm land values in Mid-Western

[10] Bulletin 874, United States Department of Agriculture, "Farm Land Values in Iowa in 1920," p. 11.

States began to decline, and have continued to do so to the present time. Moreover, the larger number of foreclosures and forced sales of farms in many Mid-Western areas have had a decidedly depressing effect upon the farm real estate market in recent years. During the past three years (1926–1928) the rates of change in ownership through defaults have not shown any marked decline in most Mid-Western States.[11]

Because of all these adverse influences, farm owners' capital investment in farm real estate in many Mid-Western States has not only shrunk in nominal value since 1913, but has continued to decline since 1920. Until more of the farms which have come on the market under forced sales and similar defaults, particularly in the wheat and corn belts, are absorbed, it is doubtful whether farm land values in the Mid-Western States will become firm.

The loss in investment value of farm real estate becomes all the more apparent when expressed in terms of dollars with constant purchasing power. Thus the real value of average per acre farm real estate in the East North Central States, as compared with the pre-war level, had declined 30 per cent in 1920, and the index dropped a further 4.2 per cent by 1928. The real value of the average farm real estate investment in the East North Central States in 1928, was about two-thirds of its pre-war value. In the West North Central States, real farm values adjusted themselves more nearly to the changed price level in 1920, but still lagged behind on an average of 20 per cent. Since then the index has declined a further 5.7 per cent.

But neither the rise in nominal farm real estate values prior to 1920 nor the subsequent decline has been equally pronounced from year to year in the East and West North Central States. In Michigan, for example, the index figure for 1920 was 154, and for 1928, 125. This represents a drop of only 18.8 per cent in nominal value since 1920. In explanation of this striking deviation of trend in Michigan farm land values from the general trend in other Mid-Western States the Director of the Bureau of Agricultural Industry of Michigan writes:

> You will wonder why the values of farm lands, especially improved lands, changed so little in this state. There is a good reason for this. It is due to the fact that when the industrial wave struck this country, Michigan, and especially Flint, Detroit, and Lansing were the cradles in which the automobile industry was rocked. Boys and girls started at once to leave the farms and go to the cities, and the supply of land offered was always greater than the demand. When farm values increased in the West we felt but little effect because the supply of good farm lands in farm units was still far in excess of the demand. After the excitement was over and farm values commenced to tumble in the West, we in Michigan had little readjusting to do because there was no inflation to any great extent in land values due to the causes mentioned above.[12]

In North Dakota the index of average farm real estate values rose less between 1912–1914 and 1920 than in any of the other Mid-Western States. It has likewise shown a relatively less decline since then (Table IV). North Dakota, formerly recognized as a one-grain crop state, has in recent years progressed more rapidly in diversification of agriculture than probably any other state in the Union. Although the index of estimated per acre farm real estate values computed by the Bureau of Agricultural Economics still

[11] Circular 60, United States Department of Agriculture, "The Farm Real Estate Situation, 1927–1928," p. 44.

[12] Correspondence, November 7, 1928.

shows a slight yearly downward trend for North Dakota, the Commissioner of Immigration of the state writes that the value of land there is

> Steadily increasing since it is producing more dollars per acre and producing them more dependably each year.[13]

*Mountain States.*—The trend in farm real estate values in the Mountain States during the past fifteen years has been peculiarly regular (Chart IV). Advancing steadily from year to year between 1916 and 1920, it has since then shown a corresponding annual decline until the 1928 index stood at approximately the pre-war level. But an examination of the trends in the separate Rocky Mountain States (Table III) reveals wide annual variations from state to state, due to such factors as methods of production, types of products, location, etc. In the Rocky Mountain States, more so than in other geographic areas, the increase in total farm land acreage has exercised a depressing influence on per acre values, inasmuch as the newly added areas have usually been low valued lands. The Rocky Mountain States, as a whole, showed a 12.2 per cent increase in farm land acreage between 1920 and 1925 (Table I), while all the other geographic divisions showed a decline in acreage ranging from 3 to 10 per cent during the same interval. The increase in farm land acreage in the Mountain States is one of the chief causes for the decline in the index of average per acre values during the past years.

This observation is borne out by the fact that the ratio of cash rent to land values prevailing in large areas of the Rocky Mountain States in 1921–1922 was much higher than in most Mid-Western States, thus indicating a sound income basis for these values, even in the years immediately following the "peak" year. In other words, whatever "inflation" may have occurred in farm land values in the Rocky Mountain States prior to 1920, it was of short duration. In recent years the recovery in the cattle industry, with prices steadily advancing, has contributed much to stabilize farm values in many of the mountain states.

With lamb prices double pre-war prices, sheep prices two-thirds higher, wool prices from three-fourths higher to double the pre-war price,. Western sheepmen have rounded out the sixth consecutive year of comparative prosperity.[14]

A comparison of changes in real values of average per acre farm real estate in the Rocky Mountain States is somewhat misleading in view of the before-mentioned increase in total farm acreage during the past years. Making due allowance for this fact, we may observe that there has been practically no change in the real values of the average per acre farm real estate of the Rocky Mountain States since 1920. Although the per acre farm value index has declined as much since pre-war years as in the East North Central States (Table V), the contributing causes were essentially different.

*Pacific Coast States.*—The trend in real estate values in the Pacific Coast States is unique (Chart IV). The index, reaching a high point of 156 (pre-war average, 100) in 1920 has declined less than 10 per cent during the past eight years. Land values along the Pacific Coast, in other words, have adjusted themselves more nearly to the change in the general level of

[13] Correspondence, November 27, 1928.

[14] Circular 60, United States Department of Agriculture, "The Farm Real Estate Situation, 1927–1928," p. 19.

prices than those in other geographic areas (Table V). Thus there has not been the heavy shrinkage in the investment value of farm real estate which has been so pronounced in some of the Mid-Western States during the past fifteen years. Furthermore, the rise in the real values of Pacific Coast farm real estate since 1920 has been greater than in any other geographic area in the United States. Moreover, the chief decline in farm values in other states occurred between 1920 and 1922, but the index for Pacific Coast farm real estate values dropped only 5 per cent during this interval.

A few of the outstanding causes of the relative stability in farm land values along the Pacific Coast may be noted. The index number of fruit and vegetable prices has compared favorably with the general commodity price index during the past three years. Furthermore, well sustained prices for dairy products and poultry have also contributed toward stability in farm values. It should also be noted that the growth of population in the Pacific Coast States in recent years has not only widened the local demand for farm products but has also encouraged residential developments in agricultural areas.

"The average returns reported by crop correspondents for the far Western division have shown a notably persistent and encouraging upward trend. If these are typical of Westerners' returns generally, the income factor would appear to be definitely operating on the favorable side of real estate values." [15]

The foregoing survey has revealed widely divergent trends in farm real estate values in different geographic divisions of the United States during the past fifteen years. The outstanding causes, contributing to such trends, have been noted, although it was obviously impossible, in the limited space available, to treat of the countless local influences affecting farm values in specific localities at different times.

[15] Circular 60, United States Department of Agriculture, "The Farm Real Estate Situation, 1927-1928," p. 18.

## SUMMARY

The impression is widely prevalent that farm land values throughout the United States have declined considerably since 1920, and that much of the trouble of the American farmer is attributable to the shrinkage in the investment value of his farm in recent years. This shrinkage, however, where it actually exists, has occurred far more since 1913 than during the so-called period of deflation since 1920. As a matter of fact, when allowance is made for price changes during the past eight years it will be noted that the estimated average per acre farm land values in the United States are at present actually higher than in 1920 (Table V).

The outstanding exceptions are the wheat and corn belts, and some of the cotton states, where there has apparently been an actual decline in farm values in recent years. But this decline, in general, appears to be a healthy correction of farm values on a sound present farm income basis after the speculative influences, exerted in part by the farmers themselves, had resulted in abnormally "boosting" farm land values in post-war years.

Since 1920 farm land values have declined more rapidly than farm incomes, with a resultant higher ratio of incomes to values. Complete data for the entire country are not yet available, but a preliminary survey conducted by the Division of Land Economics of the United States Department of Agriculture in 44 counties in Iowa, including

TABLE V—INDEX OF RELATIVE CHANGES IN REAL VALUES OF PER ACRE FARM REAL ESTATE (CORRECTED FOR PRICE CHANGES) BY GEOGRAPHIC DIVISIONS

(1912–1914 base = 100 per cent)

| Geographic Division | 1912–14 (Per Cent) | 1920 (Per Cent) | 1928 (Per Cent) | Change in Index Between 1912–14 and 1928 (Per Cent) | Change in Index Between 1920 and 1928 (Per Cent) |
|---|---|---|---|---|---|
| New England States | 100 | 61.0 | 83.5 | −16.5 | +22.5 |
| Middle Atlantic States | 100 | 60.0 | 72.0 | −28.0 | +12.0 |
| South Atlantic States | 100 | 86.0 | 88.0 | −12.0 | + 2.0 |
| East South Central States | 100 | 86.5 | 85.5 | −14.5 | − 1.0 |
| West South Central States | 100 | 77.0 | 90.0 | −10.0 | +13.0 |
| East North Central States | 100 | 70.0 | 65.8 | −34.2 | − 4.2 |
| West North Central States | 100 | 80.0 | 74.3 | −25.7 | − 5.7 |
| Mountain States | 100 | 65.6 | 65.8 | −34.2 | + 0.2 |
| Pacific States | 100 | 68.0 | 93.4 | − 6.6 | +25.4 |
| United States | 100 | 74.0 | 77.0 | −23.0 | + 3.0 |

3,400 cases in 1920 and 5,442 cases in 1925, showed that farm real estate values represented net farm earnings (arrived at by deducting taxes, depreciation and upkeep from gross cash rentals) capitalized at 2.6 per cent in 1920 and 3.4 per cent in 1925. Although there has been a more or less pronounced shrinkage in the real value of the farm owners' investment in his farm throughout the United States since 1913, it would seem that present farm values are on a much sounder investment basis than prior to 1920.

In conclusion we may note a few of the more important influences which will contribute to continued stability in farm land values in the United States:

(a) Stability in production and prices of agricultural products.

(b) Wider diversification of agricultural production with a view to spreading farm risks; also discovery of new uses for agricultural products.

(c) Improvements in agricultural methods and farm efficiency, with a view to lowering costs.

(d) Lower marketing costs by extension of coöperative marketing, thus tending to decrease the disparity between the prices the farmer receives and the prices the consumer pays for farm products.

(e) Lower burden of *ad valorem* taxes imposed upon farm real estate.

(f) Better methods of assessment and more frequent assessments of farm real estate. The valuations thus determined for purposes of taxation should reflect more nearly a uniform relationship to actual farm earnings than is the case at present.

(g) Adequate credit facilities for the farmers at reasonably low rates.

(h) Wider dissemination of information to the farmers. In this connection the radio has al-

ready served a very useful purpose.

(i) Further improvement in the methods of communication and transportation. The importance of good roads as a factor in conserving farm land values was emphasized in communications received from Commissioners of Agriculture in a number of states.

All these factors will tend to stabilize farm land values in the United States in the future and establish them on a firmer value basis than that on which they have rested during the past fifteen years.

# Population Trends

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CERTAIN data bearing on population trends are brought together here due to their bearing on the supply and demand for farm products.

## POPULATION IN THE UNITED STATES

The actual increase and rate of growth in the United States since the first census was taken in 1790 is of much interest.

TABLE I—POPULATION OF THE UNITED STATES, WITH DECENNIAL INCREASE, 1790–1920 *

| Census Year | Population | Total decennial increase | Per cent of increase |
|---|---|---|---|
| 1790 | 3,929,214 | ..... | .... |
| 1800 | 5,308,483 | 1,379,269 | 35.1 |
| 1810 | 7,239,881 | 1,931,398 | 36.4 |
| 1820 | 9,638,453 | 2,398,572 | 33.1 |
| 1830 | 12,866,020 | 3,227,567 | 33.5 |
| 1840 | 17,069,453 | 4,203,433 | 32.7 |
| 1850 | 23,191,876 | 6,122,423 | 35.9 |
| 1860 | 31,443,321 | 8,251,445 | 35.6 |
| 1870 | 39,818,449 | 8,375,128 | 26.6 |
| 1880 | 50,155,783 | 10,337,334 | 26.0 |
| 1890 | 62,947,714 | 12,791,931 | 25.5 |
| 1900 | 75,994,575 | 13,046,861 | 20.7 |
| 1910 | 91,972,266 | 15,977,691 | 21.0 |
| 1920 | 105,710,620 | 13,738,354 | 14.9 |

* Census Monograph I, "Increase of Population in the United States, 1910–1920."

The percentage of increase shows a decided uniformity during the first 70 years, approximating an increase in population of one-third every ten years. This drops to about one-fourth during the next three decades and by 1920 has dropped to the very low figure of 14.9 per cent. The 1920 percentage increase is probably somewhat misleading since restricted immigration occurred, reducing a normal immigration of about 900,000 to around 250,000 while emigration was also accelerated by the war. Nevertheless the decreasing trend of the percentages as a whole appears definite and almost certain to continue.

The actual increase in numbers is impressive. The decade from 1900 to 1910 resulted in the greatest increase in the history of the nation, approximately 16,000,000, almost equal to the entire population in 1840. With an increase of nearly 14,000,000 during the last decade and with a probable 16,000,000 increase during the present decade, it appears that the four decades ending with 1930 will show an actual population increase of about 58,000,000 almost

as great as the entire population in the United States in 1890.

The foregoing figures might be construed to indicate that the actual population is going to increase in such continued large numbers. The percentage trend shown and already commented on, however, indicates a slowing up while estimates compiled throw further light on the question.

present. The birth rate for Pennsylvania has dropped from 26.9 per cent in 1910 to 21.6 per cent in 1927. For the United States in the area covered by birth registrations, the rate has dropped from 24.9 per cent in 1915 to 20.4 per cent in 1927. The death rate has fallen from 13.6 per cent to 11.4 per cent, presumably due largely to the effectiveness of health measures but it

TABLE II—ESTIMATES OF POPULATION INCREASE FROM 1930 TO 1980

(Millions)

| | 1930 | 1940 | 1950 | 1960 | 1970 | 1975 | 1980 |
|---|---|---|---|---|---|---|---|
| Raymond Pearl * | 122,397 | 136,318 | 148,678 | 159,230 | 167,945 | ..... | 174,941 |
| P. K. Whelpton † | 123,600 | 138,250 | 151.62 | 162,670 | 171,460 | 175,120 | ..... |
| Years | 20–29 | 30–39 | 40–49 | 50–59 | 60–69 | 65–74 | ..... |
| Percentage increase by Whelpton | 16.29 | 11.85 | 9.67 | 7.28 | 5.41 | 4.68 | ..... |

* "Biology of Population Growth."

† "Population of the United States, 1925 to 1975," *The American Journal of Sociology.*

There will be noted a distinct similarity in trend and absolute size between the population estimates of Pearl and Whelpton although entirely different methods are used in arriving at the results. Both of these methods are in line with the conclusions of Dublin and Lotka [1] which show that the present birth rate and death rate are both misleading if accepted as a base for future trend estimates, The population composition is such that a large percentage falls within an age class between 20 to 45 years of age; that as this large group reaches a normal expectation of life, the death rate may be expected to increase and the birth rate to fall as the present large female age group passes the reproductive age without a corresponding number of young females in the younger age groups at

seems that as more of the population reach the old age class this death rate will increase. The present rate of 11.4 per cent would indicate a life expectancy of 87 years which is known to be far beyond the present average age.

The trends of enrollment in the various classes of the public schools in the United States, offer further evidence on the birth rate. In 1918 the first grade enrollment was 4,323,170. In 1926 this enrollment has dwindled down to 3,976,750,[2] while population was increasing at a rate of about 1½ per cent annually.

For the city of Philadelphia, the census shows a population of 1,823,779 in 1920, for 1928 2,064,200 an increase of 13 per cent. During the same period the enrollment of six-year-old school children was 27,441 and 21,786 respectively or a decrease of 20 per cent.

[1] Louis I. Dublin, and Alfred J. Lotka, "On the True Rate of Natural Increase," *Journal of the American Statistical Association*, September, 1925.

[2] Reported by Frank M. Phillips, Chief, Statistical Division, Bureau of Education.

## RURAL AND URBAN POPULATION OF THE UNITED STATES

The population of the United States is classified as rural and urban; the urban consisting of incorporated places having 2,500 inhabitants or more; the rural those under this number.

TABLE III—RURAL AND URBAN POPULATION OF THE UNITED STATES, 1880 TO 1920

| Census Year | Total Population | Rural Population | Urban Population | Per Cent Rural | Per Cent Urban |
|---|---|---|---|---|---|
| 1920 | 105,710,620 | 51,406,017 | 54,304,603 | 48.6 | 51.4 |
| 1910 | 91,972,266 | 49,806,146 | 42,166,120 | 54.2 | 45.8 |
| 1900 | 75,994,575 | 45,614,142 | 30,380,433 | 60.0 | 40.0 |
| 1890 | 62,947,714 | 40,649,366 | 22,298,359 | 64.6 | 35.4 |
| 1880 | 50,155,783 | 35,797,616 | 14,358,167 | 71.4 | 28.6 |

There has been much comment on the fact that in 1920, for the first time the urban population amounted to 51.4 per cent, the rural 48.6 per cent. In addition to the growth within the cities themselves, many former villages increase above the 2,500 number and thus take the urban classification and bringing about an apparently greater movement than is actually the case. The figure of 48.6 per cent rural population covers up a wide range of variation. In Rhode Island it is but 2.5 per cent, in New York, 17.3 per cent, in Pennsylvania 35.7 per cent while in Nevada it is 80 per cent.

## FARM, VILLAGE AND URBAN POPULATION

A group of major importance is the farm population. A three fold classification was made in 1920 showing 29.9 per cent to be farm population, 19 per cent village and 51.1 per cent urban, excluding the farms in urban territory. This is graphically shown on page 47.

Here again the percentage figure of 29.9 per cent representing the farm population covers a large range in the different states. In the New England group it is but 8.5 per cent, in New York 7.7 per cent, in Pennsylvania 10.9 per cent, in Iowa 41 per cent and in Mississippi 71 per cent.

In commenting on the farm population, Dr. C. J. Galpin states:[3]

In 1920 the United States Census gave us a count of our farm population, 31,614,269. An estimate of the farm population for 1910, by the United States Census based on careful figures, gave 32,076,960; a count of the farm population by the census in 1925 gave 28,981,693; another careful estimate of the farm population by the United States Department of Agriculture, January 1, 1927, gave approximately 28,000,000. From 1910 to 1927 according to our best calculations, therefore, the farm population (which is the core of the rural population) suffered its first break in a 100 year history of continuous growth in numbers. From 1910 to 1920 an absolute decline in numbers of half a million; from 1920 to 1925, an absolute decline of two millions; from 1925 to 1927 a decline of one million. It will be noted that the drop in numbers of farm people began in all probability before the World War and before the recent years of farm depression, indicating a subtle trend not related to the war, however accentuated it may have been by war and post-war influences.

[3] "Rural Life Progress in the United States, Ten-Year Period, 1917, 1927," address delivered before the tenth annual Conference of the American Country Life Association, Michigan State College, East Lansing, Mich., August 2, 1927.

### PROGRESS IN AGRICULTURAL PRODUCTION IN RELATION TO POPULATION

With the undisputed increase in total population together with an actual decrease in the farm population the question rises whether these two forces working to the same end may not speedily bring such a change in supply and demand for farm products as to materially increase prices and meet the question of farm relief. The evidence does not point to any such outcome in the near future.

Warren & Vaughn comment on abandoned farm land in New York State as follows: [4]

[4] *Farm Economics*, No. 56, December, 1928.

In forty-five years, the land in farms declined 19 per cent, but the acres of crops declined only 9 per cent. Yields per acre increased 17 per cent, so that in spite of the declining acreage and the millions of acres of abandoned land, the total crop production of the state increased 7 per cent. The highest production ever attained in the state was during the war period. Abandonment was rapid even in this period. Low prices have resulted in some decline in production since the war. The increased production is greater than the figures indicate because there are changes in the character of the crops. Vegetables, which have been substituted for grain, produce more food per acre. Corn is now put in the silo so that an acre produces about twice as much feed as formerly. . . . Pearl estimates that the population of the United

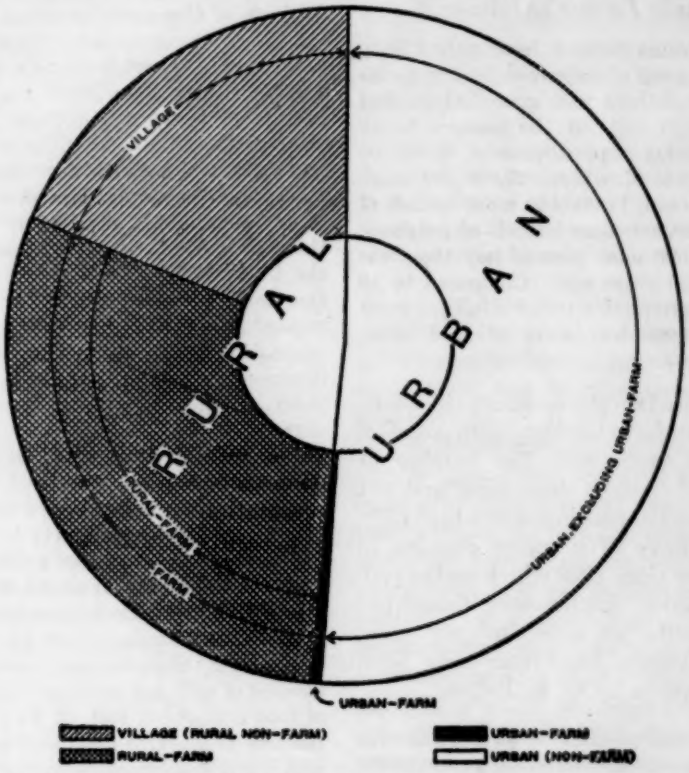


FIG. 5.—RELATION BETWEEN THE FARM POPULATION AND THE RURAL-URBAN CLASSIFICATION: 1920

States will increase about 65 per cent in the next 100 years. If this increase occurs, New York farmers can abandon more land and yet contribute their share to 65 per cent increase in food production. In spite of all the abandoned land, agriculture in New York is not decadent. The agriculture must be judged by the land used, not by the idle land.

A somewhat similar view with regard to Pennsylvania is expressed in the *Pennsylvania Farmer* as follows:[5]

Pennsylvania farmers have only 1,500,000 more acres of improved land in farms than their fathers and grandfathers had 80 years ago and yet the farmers today are producing approximately 4,000,000 more bushels of wheat, 20,000,000 more bushels of corn, 11,000,000 more bushels of oats, 15,000,000 more bushels of potatoes, and 2,150,000 more tons of hay than was produced 80 years ago. Compared to 40 years ago, production today is fully as great with 3,000,000 less acres of land being cultivated.

These are two states where the abandonment of farm land has been going on for many years with the number of farms and farmers decreasing and yet production has continued at a high rate.

There have been many changes in agriculture since 1900 which makes production today much more efficient per animal unit, per acre and per man. These changing conditions have been commented on by O. E. Baker.[6]

Agricultural production as a whole was over 14 per cent greater in the period 1922–26 than in the period 1917–21, whereas population increased less than 9 per cent between the midyears of these two 5-year periods; in other words, the increase of agricultural production was over 50 per cent greater than the increase of population.

More surprising than this rapid increase in production and resultant surplus, however, is the fact that this condition has developed despite a decreased, or at least stationary, acreage of crop land. The census of 1925 shows a decrease of about 13,000,000 acres in the area of crops harvested between 1919 and 1924, the first decrease shown by any census in our national history; while the average of the estimates of the Division of Crop and Livestock Estimates for the five-year period 1917–21 as compared with 1922–26 indicate a decrease of 1,000,000 acres. Moreover, the acreage of pasture in farms has decreased (but not total pasture), and the number of horses and cattle and hogs has decreased notably; indeed, beef cattle are less numerous than at any time during the past 40 years, and there are about the same number of hogs in the United States as 40 years ago. Furthermore, the number of farms has decreased since the World War years, the farm population and number of farm laborers has decreased even more, and the average acre-yield of the crops has increased only slightly.

This increase in agricultural production since the World War, despite a decrease in crop land and in number of livestock on farms, is owing primarily: (1) to the release for other uses of 15 to 20 million acres of crop land formerly required to feed the horses and mules which have been replaced by tractors and automobiles; (2) to increasing efficiency of production, especially in the amount of milk and meat produced per unit of feed consumed; and (3) to a shift from the less productive classes of animals per unit of feed consumed toward the more productive (*i.e.*, from beef cattle to dairy cattle and swine), and from the less productive crops per acre toward the more productive (*i.e.*, less wheat and more corn in the North, less corn and more cotton in the South, and more vegetables and fruits especially in California and Florida.)

## LOOKING AHEAD

"This substitution of mechanical for animal power on farms must continue

[5] "Pennsylvania Agriculture," by G. F. J., in the February 2, 1929, issue of the *Pennsylvania Farmer*.

[6] "Population, Food Supply, and American Agriculture," address before the joint session of the Farm Economic Association and the Rural Section of the American Sociological Society, in Washington, December 29, 1927.

for several years at least, for the number of horses and mules being raised on farms are sufficient to replace only about half the horses and mules that die annually. In addition, it should be recalled that cost of production surveys indicate that somewhat higher acre-yields of the crops will be profitable even at present prices. The more widespread use of highly efficient farm animals probably would be even more profitable. If only 50 per cent more feed is consumed by cows giving 10,000 pounds of milk a year than by giving 5,000 pounds, or even if the increase is only 20 or 25 per cent when the entire herds are compared, the possibility of a large increase in production of milk without any increase in crop acreage or in yields per acre becomes apparent. A similar, though probably smaller, increase in efficiency of swine, of sheep and of poultry is in progress and will doubtless continue for several years at least. These and many other improvements in agricultural production that are taking place indicate that crop acreage is likely to expand very slowly, perhaps not at all, in the next few years.

And looking forward a century, when our population appears likely to have become stationary, all the evidence available suggests that agricultural production can keep pace with the increase of people without much greater change in the character of the food supply occurring than that which has occurred during the past century. Doubtless there will be some decrease in the per capita consumption of meat, especially beef, accompanied, probably, by a corresponding increase in consumption of milk, cereals, vegetables and fruits; but this will be merely an adjustment to an urban manner of life on the part of the increasing number of people, such as has been in progress for several decades."

### FOOD SUPPLY AND WAR

"In conclusion, may we note one other observation—that certainly so far as North America is concerned and less certainly with reference to Europe, the progress of agricultural science and practice, in association with the decreasing birth rate, is removing much popular misapprehension with reference to the food supply as a cause of war. Such misapprehension is based on the reading of ancient rather than modern history. It has been remarked recently:

> What achievement of our mechanical and industrial age is more distinctive than that it has relegated food, *i.e.*, food as nourishment, to a subordinate place among the objects for which men labor.

Although this is not true of many peoples of the world, it is true of nearly all those who have applied science to agriculture and have entered the industrial age.

The future food supply of the American people seems assured, both with regard to quantity and variety, for at least a century, probably permanently; and if the present trends in agricultural production and population in Europe continue, that continent, it would seem, need not be anxious, provided commerce is carried on with the rest of the world. The per capita consumption of food in the United States, and probably in Canada also, was never so high as at present, both with respect to quality and variety; and in Europe it is now approaching the unprecedented standards attained just before the World War. The prospect in the orient is less promising, but the possibilities of increase in agricultural production are still great, notably in China. In Japan, the only oriental country for which such information is available, the standard of living has

risen greatly during the past 50 years, and it is to be hoped that the rest of the world will by tariff policies help rather than hinder Japan in its development of manufacturing, through which alone, apparently, it can continue to raise the standard of living of its people.

There is less reason than ever before for nations to conjure up the excuse of food supply as a cause of war. Indeed, in practically every country engaged in the World War, the food supply decreased during the war period much more rapidly than population. Population decreased only in Russia and France, whereas the food supply decreased notably in every European country participating except, possibly, in Great Britain. War offers no solution to the problems of increasing population but, instead, accentuates the difficulty. The solution, in the future as in the past, will be found in the progress of science and its application to agriculture, industry and transportation, and in the lowering birth rate which accompanies the scientific and humanitarian attitude toward life."

### POPULATION CHANGES NOT THE IMMEDIATE SOLUTION OF FARM RELIEF

Some have laid great stress on the beneficial effect to agriculture to be anticipated from the effect of population increase and changes with an estimated increase of over 45,000,000 since 1900, with a farming population decrease of nearly 4,000,000 since 1910 and with a large acreage of land being abandoned, but the ability to increase farm production together with improvements in storage and transportation, seem to have more than offset the effect of population changes.

There is little evidence of a scarcity or a decrease in the food supply with most products showing a disturbing volume. The per capita consumption of dairy products in the United States has increased as follows from 1917 to 1926:

Milk from 42.4 gallons to 55.3.
Butter from 14.6 pounds to 17.8.
Cheese from 2.89 pounds to 4.36.
Condensed and Evaporated milk from 10.49 pounds to 14.32.
Ice Cream from 2.07 to 2.77 gallons.
The total per capita consumption of meats, beef, veal, lamb, pork and lard was 156 pounds in 1900 and 153.5 pounds in 1927.

The per capita production of potatoes has varied from 2.8 bushels in 1869 to 4.4 in 1912, 4.1 in 1922, 2.8 in 1925 and 3.4 in 1927 with the crop in 1928 being so large that many bushels will not even be marketed. There has been a decrease in the per capita disappearance of wheat as flour in the United States from 5.6 bushels in 1879 to 4.32 bushels in 1925, but this must be explained on a basis of the consumers' choice because the supply of flour has been ample at all times and has been one of the cheapest foods that could be purchased.

It seems a safe assumption to say that the world was never more secure in its supply of food as to quantity, variety and quality and that any early change in the condition of agriculture must come about from some cause other than population changes now foreseeable.

# Movements to and from Farms[1]

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THERE are five months beginning in June or July, depending upon the season, in which the number of persons engaged in agriculture is above the 12-months average, the highest month being October. From November, which is usually near the 12-months a erage, to January or February the number runs down to lowest figures. As a consequence census enumerations and estimates made as of January or any other month as late as May or June are likely to be much below those made as of the busier months. Unfortunately both the agricultural census of 1925 and the annual estimates of the United States Department of Agriculture made throughout the recent critical period of population adjustment have used January 1 as their dating point. This makes it difficult to allow for a tendency which the agricultural depression has doubtless supported, namely, a tendency for the summer and fall population to exceed by relatively larger numbers the winter and spring population, not because of increase in the former but because of a tendency to cut down hired labor in the winter and spring and to turn more of the family labor toward non-agricultural occupations during seasons of relief from farm work. Hard roads and motor transportation have doubtless had an influence in enabling town-dwelling laborers to turn their energies to farm work during the farm rush season and in enabling farm youths and men to hold down supplementary jobs in town while keeping regularly in touch with their farm homes.

[1] This is mainly a continuation, though at some points a reproduction of an article, "Migrations To and From Our Farms," which appeared in these columns, January, 1925.

## Farm Population

After allowance is made for the apparent deepening of the midwinter dips in the annual farm population chart, there is no escape from the fact that both the January and the 12-months average numbers of persons engaged in agriculture have declined since about 1920. When 1929 figures become available for January as department estimates and for November as census returns, it would not be surprising to find fewer than 23 per cent of the total population included in the farm population. In fact, the department estimate for January, 1928, indicated that then fewer than 23.5 per cent of the total were farm people. A net yearly increase of about 300,000 in the farm population would be necessary in order to keep this ratio from further reduction at the present rate of increase in the total population. This is quite the opposite of that which has been occurring during much of the period since 1920, when, so far as the years 1922 and 1924–27 are concerned, the average yearly change in farm population was about 390,000 decrease. For the farm population thus to fall short of holding its proportional place by nearly 700,000 year after year means that if continued there will be fewer than 20 farm people in every 100 in the total population by about 1932. This rate of change in the farm population ratio is nearly the same as that which has taken place in percentage of gainfully

occupied persons engaged in agriculture (Fig. 1).

PROPORTION OF POPULATION OCCUPIED AND OF OCCUPIED PERSONS ENGAGED IN AGRICULTURE, UNITED STATES, 1820–1920.

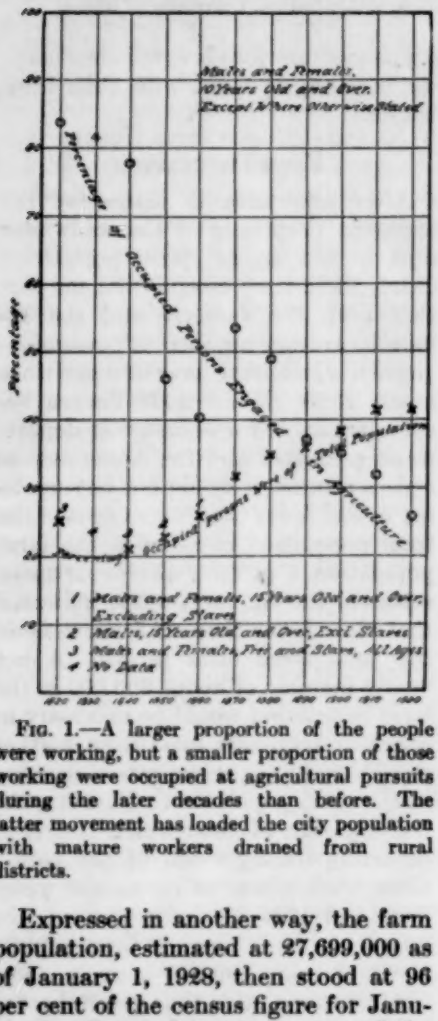
Males and Females, 10 Years Old and Over, Except Where Otherwise Stated
Percentage
Occupied Persons Engaged in Agriculture
Population
1 Males and Females, 15 Years Old and Over, Excluding Slaves
2 Males, 15 Years Old and Over, Excl. Slaves
3 Males and Females, Free and Slave, All Ages
4 No Data

FIG. 1.—A larger proportion of the people were working, but a smaller proportion of those working were occupied at agricultural pursuits during the later decades than before. The latter movement has loaded the city population with mature workers drained from rural districts.

Expressed in another way, the farm population, estimated at 27,699,000 as of January 1, 1928, then stood at 96 per cent of the census figure for January 1, 1925, and at 88 per cent of the census figure for January 1, 1920. The number of persons gainfully occupied in June, 1900, was nearly identical with the number so occupied in January, 1920, but if the two enumerations had been made 20 years apart to the month the 1900 census would probably have shown fully 5 per cent fewer persons in agriculture than the 1920 census. The high census of 1910 was probably due to some over-enumeration and to the April dating which caused the number of persons found in agriculture to be considerably larger than in January. It is apparent, therefore, that at some time between 1900 and 1920, possibly within a few years of 1910, farm population reached its highest absolute figures. Compared with this high point the present farm population is probably less by 15 or 20 per cent.

The extent to which natural increase resulting from excess of births over deaths has operated to offset the "indraught of the cities" is indicated in the department estimates for the four years, 1924–27. Deaths were estimated in thousands as follows: 266, 288, 287 and 236, average 269, or nearly 1 per cent; and births: 763, 710, 658 and 647, average 695, or nearly 2.5 per cent. The decline of 11 per cent in the number of deaths between 1925 and 1927 was over twice the rate at which the farm population decreased but the number of births decreased at a rate three times as rapid as the rate of decrease in the farm population. Thus natural increase seems to have been of decreasing effect in maintaining the farm population.

## MIGRATION OF POPULATION

The gross movement of population from farms to cities and towns was estimated in thousands as 1,809, 1,747, 1,868 and 1,742, average 1,791, over six times the number taken away by death. The gross movement of population from cities and towns to farms was put in thousands as 633, 425, 477 and 727, average 565, or not quite 80 per cent of the number of births in the farm population.

Deductions from the farm population were caused by the hand of death much

less than by the feet of the living, setting out for urban destinations. On the other hand, additions to the farm population were made by emigration from urban sources less than by visitations from the stork.

The department estimates reviewed above are the product of investigations directed by Dr. C. J. Galpin, and published in the months, February to July, following the years covered. The same student has made certain analyses of migration of population to and from farms in mimeographed publications of October, 1927, and November, 1928.

One analysis deals with the conditions and points of view of 2,745 persons who left farming for urban residence and occupation and who responded to inquiries made of them in 1926 and 1927. At the time of leaving the farm 16 per cent were tenants and 84 per cent were owners. Out of 2,307 farm owners going to urban points, 1,681, or 73 per cent, still owned their land when they replied to the inquiries. About 6 per cent of the tenants among the migrants were still owning farms. It is possible that some had moved to town in hopes of earning enough to keep from losing their farms. Other points in the summary follow:

> The migrants had, on an average, between one and two of their children with them in the city, town or village home. The average number of children in each family was a little over three. These farmers were evidently farmers of long standing, on the whole. These farmers were about equally divided among those who had never done anything but farm, and those who had tried other occupations. Most of these farmers had been cultivators of moderately large farms. One-third of those who still owned farms after moving received over half their present income from farms. About one-third of the farms of those who still own their farms are operated by tenants who are related. The schooling of the children of these farmers had gone farther than that of the farmer, for three-quarters of the children had either finished the eighth grade or had been in high school.
>
> Four main reasons for migrating from the farm were emphasized:
>
> 1. Not being able to make ends meet, while on the farm. This was the chief reason that a full third of these migrants gave for leaving.
>
> 2. Physical disability. This led to the going of one-quarter of the farmers.
>
> 3. To gain a better schooling for their children. This ranked high as an inducement with both owners and tenants.
>
> 4. Financial ability to live in the city. This was mentioned by one farmer out of every forty.

The analysis of the conditions and points of view of 1,167 persons who moved from urban points to live and work on farms is no less significant. As the author points out, the outstanding fact about these people is that nearly 87 per cent had previously had farm experience. More than a third of those who had previously farmed had owned farms before, and one-third had been tenant farmers. These migrants had an average of 2.1 children to the family, the families of tenants and hired workers being larger than those of owners. These migrants were in the early prime of life. About two-thirds of them found that they could make better livings on farms than in town.

Reasons given for changing back to agriculture included the following:

1. The belief that better health would be found for parents and children.

2. The high cost of living in cities. This counted especially with those who became hired workers.

3. The tiring effects of city life.

4. The belief that the farm offers an independent life.

Whatever may have been the causes for the town-to-country and country-to-town shifts, certain regional differences stand out.

During the three years, 1925–27, births were a larger percentage of the total farm population in the Central and South Atlantic States than in any other regions. In the Pacific States, where the ratio was lowest, annual percentages between 1.2 and 1.7 were found. These are about half as large as those prevailing in the East South Central group.

Deaths were a larger percentage of the total farm population in the New England and Middle Atlantic States than in any other groups, the three Southern groups showing percentages above the national average also. The North Central States, particularly those west of the Mississippi River, showed death to be accounting for the departure of smallest percentages. The presence of a large number of older farmers in the Northeastern States accounts for the high death rate and comparatively low birth rate in those regions. In Southern States the tendency toward high rates of births as well as of deaths calls to mind a general condition among poorer negroes.

In respect to the ratio which net births over deaths were to the total farm population the East South Central and South Atlantic States stood first, the West South Central States third and Rocky Mountain States fourth. In New England where this ratio was smallest the annual excess of births over deaths was about 5 in 1,000, compared with nearly 20 in the East South Central States.

The ratio of yearly arrivals from urban points to the total farm population was highest in the Pacific and Mountain States and third highest in New England. In the South Atlantic States this ratio was lowest, only about one-third as high as in the Western States indicated. The figures for the North Central States were only slightly above the general national average.

The yearly departures to urban points were a larger proportion of the total farm population in the Mountain and Pacific States and in New England than in other sections. Departures were relatively fewest in the East South Central and South Atlantic groups.

The excess of departures over arrivals, apart from cases of birth and death, was in highest ratio to the farm population in the Mountain States and in the South Atlantic division, and was in lowest ratio in New England and in the Pacific States.

It is clear, therefore, that while natural increase was most marked in Southern States and least marked in the Pacific and Northeastern States, the self-directed departure of individuals and families, viewed in terms of net outbound movement, was most pronounced in Mountain and South Atlantic States and least pronounced in New England and Pacific States.

When arrivals of all kinds are balanced against departures of all kinds, arrivals were in the ascendency in two groups of states in 1924 and again in 1927, the South Atlantic States being included both times, the other group being New England in 1925 and East South Central States in 1927. In general, however, the four years, 1924–27, were years in which departures exceeded arrivals in all parts of the United States. The outbound movement, all told, was most marked each year in the Mountain division in spite of comparatively large arrivals from urban points. The outbound movement was least marked, all told, in New England, in spite of high death rates and low birth rates in that section.

Not all of the movements from farms or to farms have to do with additions to or deductions from urban population. That many movements by farmers are from farm to farm is clearly evidenced by various studies in the field. The

following table is modified as to form from Table 9 of a memorandum of February 25, 1928, concerning House Bill 393 providing for a census of population, distribution and agriculture, transmitted by the secretary of agriculture and incorporated with the hearings before the House Committee on the Census, February 10, 1928 (Fifteenth and Subsequent Decennial Censuses, page 281).

TABLE I—DISTANCE MOVED BY INCOMING FARMERS, 13,815 FARMS, 1925–26

| | United States | North-eastern * | North Central † | South Central ‡ | West § |
|---|---|---|---|---|---|
| Number of moves studied: | | | | | |
| Tenant operators | 9,725 | 807 | 5,178 | 3,171 | 569 |
| Owner operators | 4,090 | 586 | 1,964 | 1,190 | 350 |
| Percentage of moves by distance: | | | | | |
| Tenant operators— | | | | | |
| Under 5 miles | 42 | 47 | 40 | 47 | 37 |
| 5–9 miles | 23 | 25 | 25 | 20 | 18 |
| 10–24 miles | 21 | 19 | 22 | 18 | 19 |
| 25–100 miles | 9 | 7 | 7 | 10 | 16 |
| Over 100 miles | 5 | 2 | 6 | 5 | 10 |
| Owner operators— | | | | | |
| Under 5 miles | 36 | 43 | 35 | 37 | 23 |
| 5–9 miles | 18 | 18 | 21 | 17 | 17 |
| 10–24 miles | 20 | 17 | 20 | 19 | 17 |
| 25–100 miles | 14 | 14 | 13 | 14 | 20 |
| Over 100 miles | 12 | 8 | 11 | 13 | 23 |

* New England and Middle Atlantic States.
† East and West North Central States.
‡ South Atlantic, East and West South Central States.
§ Mountain and Pacific States.

As pointed out in the memorandum, in the United States as a whole, 58 per cent of the farmers moving moved 5 miles or more and 35 per cent moved 10 miles or more. The proportion of short-distance moves was larger in Northeastern and South Central States than elsewhere. The department estimated that 92 per cent of the farmers live within 10 miles, and 48 per cent within 4 miles, of a county line. Movements within the same county or between adjoining counties which account for a large proportion of all moves by tenants and owners are not in all cases moves from farm to farm, but many of them are.

## MOVING PERIODS

As to the month in which farmers move and the number and proportion of all farmers moving some further addition has been made to our stock of comprehensive information for the nation as a whole. Here the effort on the part of department workers to cause the next census of agriculture to be taken as of November, 1929, is immediately responsible for causing publication of figures previously unpublished but providing at least confirmatory evidence as to the correctness of impressions held previously with reference to these questions.

As stated in my January, 1925, article in *The Annals*, both owner and tenant operators begin and end their operations on farms mainly in the late winter and early spring, especially in

March, except in Southern states, where December-January moving predominates. In general, the moving period falls within the bounds set by annually finishable products. The season of minimum unfinished operations, when farmers have a breathing spell, is the time when operators can best move.

So far as tenant farm operators are concerned the memorandum of the secretary of agriculture contains in Table 8 previously unpublished data from the Bureau of the Census, which gives clear indication of the tendencies with respect to moving periods. The monthly distribution shown is as follows for the United States as a whole: January, 29; February, 5; March, 24; April, 10; May, 3; June, 1; July, 1; August, 3; September, 3; October, 6; November, 7; December, 8. The moves referred to were those which took place in the case of about 100 tenant farms in each of about 3,000 agricultural counties in the United States. This tabulation indicates relatively less moving in November, December and February, especially December, than estimates for 1922 indicated. As between individual years it is clear that differences as to the time when the harvesting of cotton and other crops is completed and other factors make considerable difference in the percentage distribution of moves as between the various months from November to March. Furthermore, out-of-season moves may tend to give a relative prominence to summer moves in years when the total amount of shifting is small.

The number of farm operators moving in the United States during the crop year, 1925-26, is indicated to have been over 890,000, or 14 per cent of farm operators of all tenures, as indicated by Table 7 of the memorandum under consideration. This is about 140,000 more than the three-quarters of a million tenants who had been in occupancy less than a year at the time of the census of April 15, 1910, about 205,000 more than the number of less-than-a-year tenants reported by the census of January 1, 1920, over 220,000 more than the number indicated for 1922, and nearly a half million more than indicated for the year ended April 10, 1924. Part of the excess shown for the crop year, 1925–26, arises from the fact that owner operators were included and not shown separately. In the light of statistics examined in the 1925 article it is safe to estimate that each year a quarter of a million new owners had been taking up the operation of farms not previously operated by them. This number is probably somewhat smaller for most of the years since 1924, but if the estimated number of owner operators who moved during the crop year, 1925–26, is much reduced, the number of tenant farmers moving that year cannot be much smaller than during 1922 and 1924.

It is clear, therefore, that both in its seasonal phases and in its trend through the decade following 1920, farm population has been showing notable adjustments to the new economic conditions affecting agriculture. Much of the migration of both owner operators and tenant operators has been distress migration, in the case of the tenant migration the distress characterizing the tenants themselves or the present or the former owners of the rented land. Measures of distress conditions leading to the moving of tenants, however, have not been so well worked out as in the case of owners.

### CHANGE IN OWNERSHIP

The number of farms changing ownership in each 1,000 farms is shown for the three years, 1926–28, in "The

Farm Real Estate Situation," 1927–1928, by E. H. Wiecking, United States Department of Agriculture, Circular 60, pages 44 and following. The total of all classes of transfers of farms was 66 in a 1,000 in 1928, and 68.5 in 1927. Excluding administrator's and executor's sales, the number in 1,000 in 1928 was 59.3, in 1927, 61.5, and in 1926, 61.4. Inheritance or gift accounted for transfers as follows: 1928, 8.9; 1929, 8.8, and 1926, 8.0. Delinquent taxes accounted for 5.2 farms changing ownership in 1,000 in 1928, 5.1 in 1927, and 4.2 in 1926. Foreclosure of mortgage, bankruptcy, etc., resulted in the transfer of 17.6 farms in 1,000 in 1928, 18.2 in 1927 and 17.4 in 1926. Voluntary sales and trades effected transfers in the case of 26.3 farms in 1,000 in 1928, 28.3 in 1927 and 29.6 in 1926.

The changes in ownership resulting from administrator's and executor's sales were highest in the East North Central States and lowest in the Pacific, Mountain and West South Central groups.

Inheritance and gift played their largest part in the South Atlantic and New England divisions, and their smallest rôle in the Mountain and Pacific States.

Tax delinquency was relatively marked as a cause of the transfer of farms in Mountain and South Atlantic States, but was least to be noted in New England and Middle Atlantic States. The case was but little different when transfers by foreclosure of mortgages, bankruptcy, etc., are considered, except that the West North Central States take the place of the South Atlantic group.

Voluntary sales and trades were relatively more significant in New England, Pacific and Mountain States and least marked in the South Atlantic group.

In general, it appears that the ratio of farms changing owners has remained during recent years between 6 and 7 per cent, the percentages shown for 1922 and 1924, respectively. These percentages do not seem large but with the shrinkage of voluntary sales and trades and the expansion of forced sales and other defaults the stage has remained set for the widespread and severe decline in farm real estate valuations which has in turn brought further expansion in the proportion of distress sales.

## CONCLUSIONS

Migrations affecting the farm population have occurred in response to economic conditions. Migrations within rural districts have kept at higher figures than might have been expected if there had been less compulsory shifting of titles and less bankruptcy of operators not farming their own land.

Migration from farm to town attained during the years following 1920 proportions beyond any precedent in the history of this country.

While there is little evidence of increase of tenant operation, except in the Great Plains region and in some restricted areas in other parts of the country, there is little doubt that the proportion of prospective heirs to farm property, who have become engaged in non-agricultural occupations, has been increased by recent migrations. Even more than previously the non-agricultural destination of farm-reared youths calls for a more satisfactory apportionment of the burden of taxes levied to support primary and secondary schools.

# Tendencies in Milk Production in Massachusetts

## A Study in Land Utilization

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THE United States has rapidly become industrialized and urbanized within this last generation or two, and the near future promises still greater development in the same direction. It is a matter of very real moment what influence this is likely to have upon the development of agriculture in its national tendencies and in its local geographical distribution.

The following study does not attempt to answer this question as a whole. It does, however, offer a considerable body of evidence upon certain phases of the question and advances a type of method which may be used, among others, in solving the general problem.

Massachusetts has been tending toward industrialization and urbanization. This movement has been in progress for a long time. This growth of urban life, with its expanding markets and its inducements to those looking for congenial living conditions and favorable terms of employment, has been and probably will be one of the major factors in determining the development of agricultural enterprises.

Another very important economic force affecting the dairy industry of Massachusetts is the competition with distant dairy areas where, frequently, land is cheaper and the degree of dependence upon purchased feed is less.

These economic forces have been in operation for decades. They have also been operating in other parts of this country and in other countries of the western world. It is possible to analyze the results of the interplay of these forces upon the dairy industry both geographically and historically, thus giving two different pictures of the situation. If this analysis shows any clearly defined tendencies or principles in the development of the dairy industry it may be accepted as a fairly safe guide in planning for future developments.

### Existing Production Estimates

The state census of Massachusetts enumerated the number of cows in the census year of each decade from 1855 to 1905. From 1875 to 1905 the milk production was reported. No such census was taken after 1905.

The federal census has published data showing the number of dairy cows at the end of each decade since 1860 and the milk production since 1900. A special agricultural census also shows the number of dairy cows in January, 1925, and the milk production on farms in 1924. Evidently more complete data were gathered by the census prior to 1900 than were published, for Major Henry E. Alvord, who had access to all the government records, published[1] figures showing the dairy cows on farms and the average milk yield per cow for each census year

[1] Alvord, H. E., "Statistics of the Dairy," U. S. D. A., Bureau of Animal Industry, *Bulletin No. 55*, 1903.

in the period from 1850 to 1900. His figures give only state totals. The federal census publications show certain data for each county, and the state census figures are tabulated by towns.

For over half a century figures have been collected by the tax assessors of Massachusetts and published yearly showing the number of cows in each town.

Since 1924 the New England Crop Reporting Service has published annual estimates of the number of "milk cows" and the milk production in New England. These estimates are based upon the data of the census and the tax assessors, reports from crop correspondents, and a considerable amount of other information. They give detailed data for each state and county by months and years.

The complete statistical facts supplied by these agencies are too voluminous to present here in detail. We shall, accordingly, confine ourselves to discussion of what they reveal.

## HISTORICAL TENDENCIES IN PRODUCTION

When the data from these four sources are examined together it is evident that some of the figures are incomplete. It is true that the enumerations were made at different times of the year, but this alone can hardly account for the extreme discrepancies in the data from the various sources. The different times of year for gathering data, the different definitions of terms and the varying policies, purposes and methods of enumeration and tabulation have tended to detract from the comparability of their data. There is no certainty that the different federal censuses are more comparable with each other, as regards completeness of data, than with the various state censuses or even with the recent estimates of the Crop Reporting Service. Certainly the federal census has not fully chronicled the recent growth of the dairy industry on the small holdings of the city workers. The fact that the policies and rules for any one census have been fairly consistent and uniform throughout the whole territory covered at one time makes geographical comparisons for any one year less liable to error than historical comparisons for any given area.

Within recent years figures of the tax assessors have not been inflated by oxen. Since cattle under one year old are exempt from taxation, few farmers would allow the assessment of such animals. Moreover, separate categories are set up in the returns for taxable cattle other than cows. Since there is now almost no opportunity for the inclusion of other cattle, it is evident that the number of cows recently reported by the assessors is not over-estimated. It is easily possible, however, that some cows escape enumeration. Unpublished compilations recently made from the records of the Department of Conservation indicate that figures of the tax assessors are in general about 5 per cent too low.

The census data are consistent up to 1905, state and federal figures alike showing irregular increases until 1895 and but little change for the next decade. The slight recession shown by the federal census in 1900 is subject to some question since the tax reports show that year to have been a high point.

Throughout the period from 1895 to 1910 the census figures are consistently greater than the assessment figures. It is logical that this should be so at all times. It points to the conclusion that the census data on the number of cows are fairly complete for that period.

Since 1910 the census figures are

below those of the tax assessors. This is due in part at least to the fact that within recent years many cows are kept in or near the smaller cities and villages by persons whose main occupation is not farming. The census of 1925 reported a total of 2,796 fewer cows in Bristol County than the tax assessors reported and the census deficiencies cumulated by towns in that county were 2,981.

In the whole state there were 179 towns and cities for which the census showed 14,127 fewer cows than the assessors reported. On the other hand, in 172 towns the tax assessors reported 10,732 fewer cows than were shown by the census. Since it is very unlikely that either census enumerators or tax assessors found more cows in any town than existed there, it is highly probable that the larger number of cows reported for each town is not too great. On the basis of this assumption the state had 159,025 cows in 1925.

The New England Crop Reporting Service estimates the number of "milk cows" in the state at 153,000 on January 1, 1926. These "milk cows" should be less than the total number of cows, for this category excludes "dry" cows.

Census data on milk production are estimates at best. Many farmers now have records of milk sold and report this for milk production, omitting the milk used by the farm family and fed on the farm. In many cases only a general estimate on the part of the farmer or enumerator is behind the amount of production reported. The federal census for 1909 has this to say regarding the accuracy of its milk production data for Massachusetts:

> Dairy products in general are somewhat less accurately reported than the principal crops. This is particularly the case as regards the quantity of milk produced. . . . The amount of milk reported was 86,304,000 gallons; assuming that there were the same number of cows in 1909 as in 1910, this would represent an average of 526 gallons per cow. In considering this average, however, it should be borne in mind that the quantity of milk reported is probably deficient and that the distinction between dairy and other cows is not always strictly observed in the census returns.

The census for 1920 showed 68,624,097 gallons of milk "as reported" on the schedules and estimated the true total production as 76,316,309 gallons. This latter figure is probably too low, however, for the number of cows reported was only 147,331, four per cent less than the 153,489 found by the tax assessors.

The census for 1925 reported 86,575,083 gallons of milk produced, including estimates for incomplete reports. This is based upon a number of cows which, as already noted, appears to be deficient. It amounts to 613 gallons per cow milked.

The New England Crop Reporting Service, after careful study of a large number of actual records of yield per cow in this and other states, and after considering all available data, estimates a total state production in 1925 of 106,388,372 gallons or 695 gallons per "milk cow."

The following table shows the changes in the yield per cow as reported by Major Alvord[2] for 1850 to 1900 and as shown by the federal census for later years.

Contemporary collateral evidence supports these figures for half a century ago. In 1874 it was noted in the annual report of the board of agriculture for the neighboring state of New Hampshire that "the common run of cows" produced 1,500 quarts of milk per year.[3]

[2] U. S. D. A., Bureau of Animal Industry, *Bulletin 55*, "Statistics of the Dairy," by H. E. Alvord (cited on page 2).

[3] *New Hampshire Agriculture*, 1874, p. 67.

CHANGES IN YIELD PER COW IN MASSACHUSETTS

| Year | Gallons per Cow |
|---|---|
| 1850 | 250 |
| 1860 | 215 |
| 1870 | 327 |
| 1880 | 396 |
| 1890 | 480 |
| 1900 | 572 |
| 1910 | 526 |
| 1920 | 506 |
| 1925 | 613 |

It is very evident that in the last half of the last century both the numbers of cows and the production per cow increased. The production increased more rapidly than the numbers of cows, for the yield per cow doubled. During this period beef production and the raising of oxen practically ceased to be a factor in the local cattle industry.

Since 1900 the earlier rate of increase certainly has not been maintained consistently. The number of cows increased until 1906. After that year all the evidence shows a decline in the number of cows, although the tax assessors' data indicate that the decline was less than shown by the census figures. This decline coincided with a decrease in consumption of milk, as evidenced by reported milk receipts at Boston. During the war years and until 1922 the number of cows increased.

The yield per cow was greater in 1920 than in 1900. Whether or not it decreased as much in the first part of this period as indicated by the census is not certain. The data of the New England Crop Reporting Service show a yield per cow in 1925 much greater than that estimated by the earlier census reports. Using their data as a basis, a higher state total production of milk is indicated for 1922 than for any previous year. The evidence is not absolutely conclusive, for the records are not strictly comparable, but the weight of the evidence points clearly in that direction.

Since 1922, undoubtedly there has been a decline in the number of cows. Nevertheless most of this decrease has been offset by an increase in the yield per cow.

Based on figures acknowledged to be imperfect it is noteworthy that a decided increase in yield per cow accompanied or followed the decrease in the number of cows which occurred both in the period following the Civil War and in the later period of decline which ended at about the time of the European War. These major changes in the industry seem to have helped to weed out the cows of smaller production.

### COMPARISONS WITH OTHER STATES

All the New England states have shown somewhat the same general changes in milk production throughout the last seventy-five years. Nevertheless, some significant differences appear.

All of the states showed a marked increase in milk production until about the year 1900. The federal census figures indicate a very real decline in production from 1899 to 1909 in every state but Rhode Island, where the decline was small. During the next decade data from the same source indicate a severe decline in Massachusetts, lesser declines in New Hampshire and Connecticut, almost stable output in Vermont and Rhode Island, and a real increase in Maine. The agricultural census of 1925 indicates an increase for every state but Maine and New Hampshire. Taking the seventy-five-year period as a whole, the data of the census and Major Alvord's more complete statistics show that the rela-

tive increase in production in Vermont and Massachusetts has been about equal, the former slightly exceeding the latter. If the data of the New England Crop Reporting Service are taken for the year 1925, the increase in Massachusetts has been greater than that in Vermont. Except in Rhode Island, whose production quadrupled during the three-quarters of a century the increase in none of the other states equals that of these two.

### TRENDS OF PRODUCTION BY COUNTIES

The changes in milk production in the several counties have, as a rule, roughly paralleled those of the state as a whole. In all the counties but Suffolk the tendency was upward until about 1900. The rule from then until 1920 was for decline and since then for increase.

The production peak as shown by the census data appeared in 1905 for Worcester, Middlesex, Essex, Bristol, Norfolk, Plymouth and Barnstable counties. The western counties, of Berkshire, Franklin, and Hampshire reached their recorded peak in the federal census of 1900. Hampden county had a greater production in 1905 than in 1900, thus following the lead of the more densely populated eastern counties. The smaller producing counties of Barnstable, Suffolk, Dukes and Nantucket all showed a much higher output in 1905 than in 1900.

None of the counties escaped the recent decline, according to the census reports of 1909 and 1919. However, in the case of Bristol and Plymouth the recorded decline in these years was so small that it is probably unreal, for the census data of milk production by counties are admittedly incomplete.[4] In these counties the production shown by the agricultural census of 1925 was decidedly greater than any previous record.

The more complete estimates of the New England Crop Reporting Service, which include the production of all milk whether on farms or urban back lots, indicate much higher records for Barnstable, Bristol, Dukes, Franklin, Norfolk, Plymouth and Nantucket counties in 1925 than in any previous census year.

### TRENDS OF PRODUCTION BY TOWNS

Milk production by towns is not available from census reports between the years 1905 and 1925. The tax assessors' reports give the number of cows for each year, and some tentative conclusions may be drawn regarding milk production trends on the assumption that the yield per cow increased with approximate uniformity throughout the state. Any deviation from such uniformity would doubtless lie in the direction of greater increases in the towns near large cities, where the dairymen are accustomed to replace their dry cows with purchased stock. The following conclusions are based upon the tax assessors' data with the assumption of uniformity in increase in yield.[5] The fact that some oxen were assessed as cows in the earlier years somewhat obscures the tendency toward increase in the number of cows which more perfect statistics would bring out more clearly:

1. The nearness of urban markets and the competition of interstate commerce in milk have not proved a cause of depression to milk production. Were the statistics more perfect it might be possible to state this conclusion positively rather than in negative form.

2. Both extreme urbanization and

[4] Only in the state totals for these censuses are the fuller "estimated total production" figures given in addition to the smaller totals designated "as reported."

[5] These data are too detailed for presentation.

rural isolation have had a tendency to discourage dairying. Nevertheless, some towns, while achieving important urban development have managed even to increase their dairying. Some hill towns have also maintained their dairying, usually aided by creameries or available fluid milk markets.

3. In some of the best tobacco towns of the Connecticut Valley milk production has decreased. Some of the towns formerly shipping to the Boston market decreased their milk production following the loss of this market in the "milk strike" of 1910.

## GEOGRAPHICAL TENDENCIES IN PRODUCTION

Comparisons between different areas in the same time present another point of view supplementary to historical comparisons. They show economic reactions to different geographical conditions with the same available technique of the industry. Available statistical data are more nearly comparable for different areas at the same time than for the same areas at different times. It is, therefore, safer to use more highly refined statistical methods in the analysis of such comparative data.

Among the various geographical conditions which might be used as a basis for the study of the development of the dairy industry, that of density of human population is most usable and seems most pertinent to the purposes of this study. Increasing density of population has paralleled the growth of industrialization and urbanization. Moreover, the density of population tends to increase as the cities are approached. Such increase is moderately regular in a modern community except as water, mountains or other obstacles to human habitation intervene.

Outside of cities the density of total human population per unit of total area and the density of farm population per unit of farm land increase and decrease together with a considerable degree of correlation.[6]

Density of farm population per unit of farm land will be taken therefore as an index of the geographical influence of industrialization and urbanization. The question then becomes, what is the reaction of the dairy industry to such density of population?

The accompanying diagram shows the relation between the number of cows and the farm population per unit of land in farms in the towns of Massachusetts. Since the farm population is not given directly in the census, it has been assumed that the average number of people per farm was uniform throughout each county. The towns of the two counties, Suffolk and Nantucket, for which an examination of the statistics showed such an assumption to be most inaccurate, were excluded from the diagram and the following calculations. Cities having 25,000 or more inhabitants were also excluded on the assumption that what agriculture they have is not important. In the diagram each dot represents a town. Its distance from the perpendicular line at the left shows the density of its farm population and its distance from the horizontal base line the density of its cows. It will be readily observed that as the human density increases the cow density also tends to increase. There is, of course, no absolute uniformity of such relation, but only a general tendency subject to exceptions. Absolute uniformity of relation would place all the dots on a straight line and would give a mathematical correlation of 1 between the densities. The conditions as they exist give a correlation of .661. This

[6] These relationships have been plotted, but are not presented in detail.

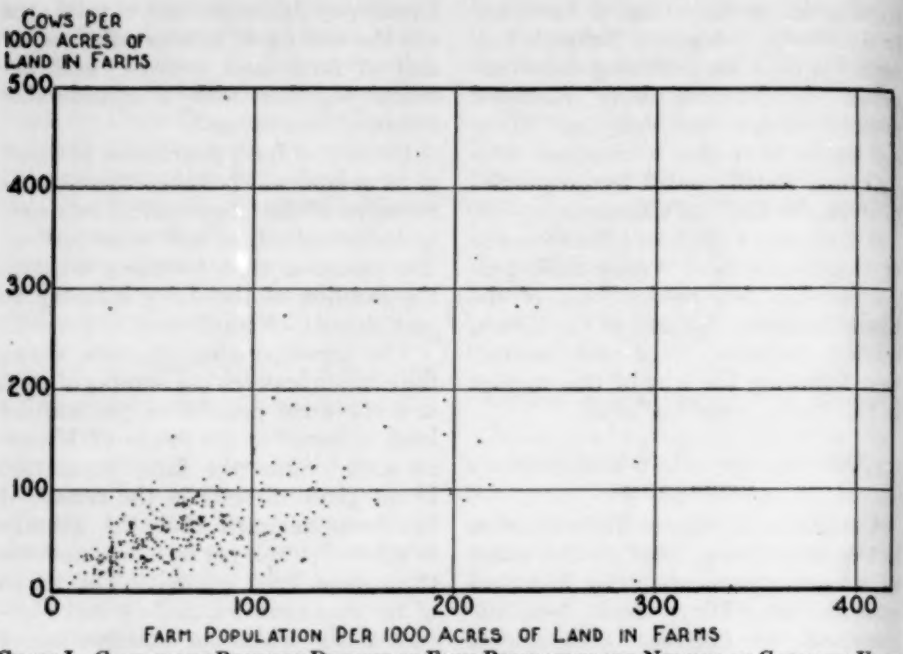


CHART I—COMPARISON BETWEEN DENSITY OF FARM POPULATION AND NUMBER OF COWS PER UNIT OF FARM LAND IN THE TOWNS OF MASSACHUSETTS

indicates real correlation, especially since the probable error is very small on account of the large number of items taken under consideration. The amount of this probable error is only .021. When the cities of 25,000 and more inhabitants are included, the correlation is .386 with a probable error of .031.

Correlation between two characteristics of a series of items does not of itself prove a functional relationship. Neither does it prove that the relationship will hold under different conditions than those in existence in the situation under observation. It is advisable to use the canons of logic as well as the methods of statistics in drawing conclusions. Accordingly, the question has been investigated as to whether or not this relationship holds true under different circumstances. This necessitates going outside of the state for examples.

The following diagrams show the relationship between the density of farm population per unit of area of farm land and the density of cows in the counties of New England.

The correlation between cow density and farm population density in southern New England is .522 with a probable error of .094. For all New England counties the correlation is .432 with a probable error of .067. If the counties in Vermont which border Lake Champlain and enjoy unusually good pasturage are excluded, the correlation is .491 with a probable error of .064. The data for these counties are very much out of line with the general tendency. Were it possible to set off such agronomic factors as good pasturage by means of multiple correlation, a much higher degree of correlation would be found.

Taking the data for each of the states in the whole country, the corre-

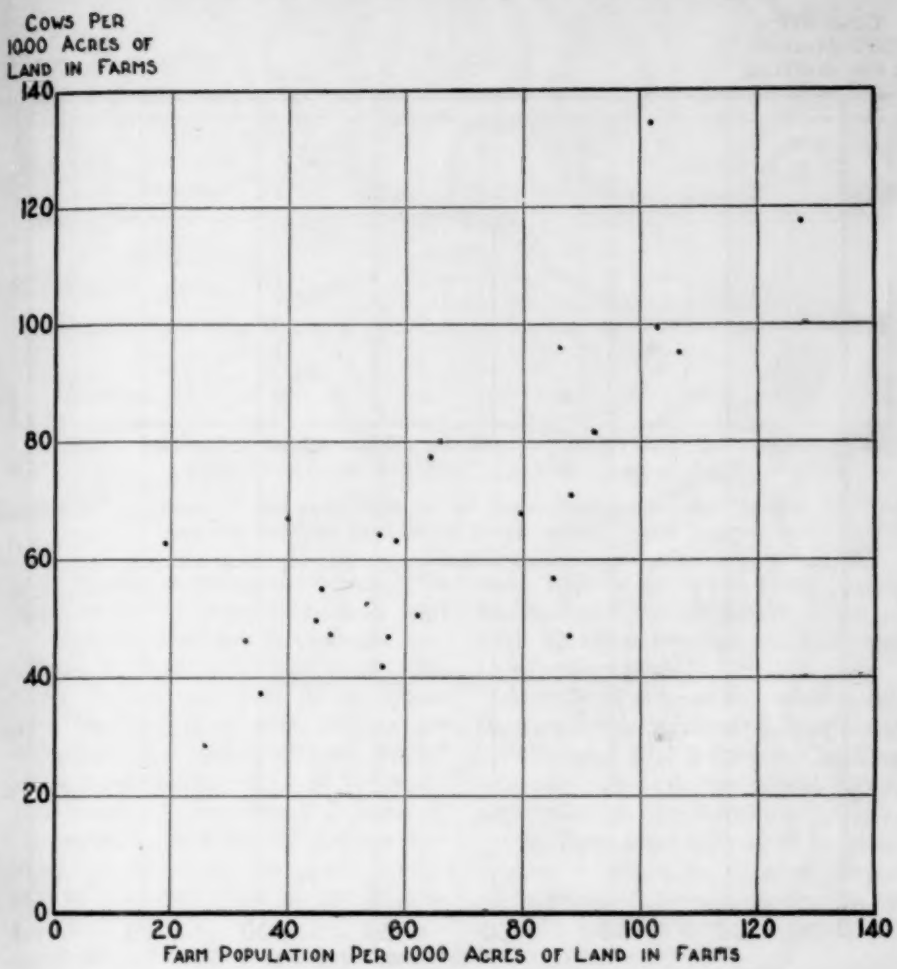


CHART II—COMPARISON BETWEEN DENSITY OF FARM POPULATION AND NUMBER OF COWS PER UNIT OF FARM LAND IN THE COUNTIES OF SOUTHERN NEW ENGLAND

lation between the density of farm population and cows is .509 with a probable error of .072.

In order to get evidence from an entirely different environment and under conditions where economic conditions have come more nearly to a balance, European data have been examined. There it is difficult to get farm population data for all countries on a comparable basis. The same is true to a certain extent for dairy cows as distinguished from the total of all cattle. However, practically all cattle are connected with the dairy industry in Europe, except in the British Isles and even there the dairy industry is as highly developed as beef production. Accordingly, the relation between the density of the total human population and that of all cattle per unit of total area in the European countries has been examined. The correlation in this case is .823 with a probable error

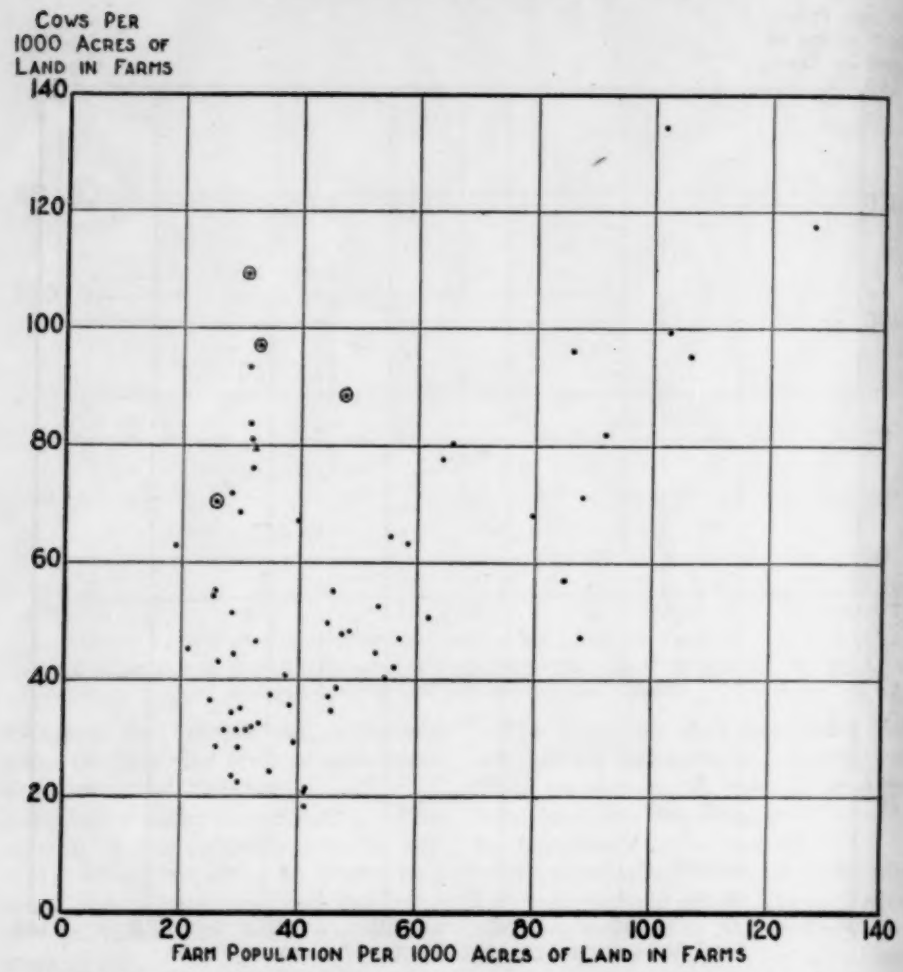


CHART III—COMPARISON BETWEEN DENSITY OF FARM POPULATION AND NUMBER OF COWS PER UNIT OF FARM LAND IN THE COUNTIES OF NEW ENGLAND

of .054. Under New England conditions as they exist at present, there is not such a simple relationship of the dairy industry to the total land area and the density of the total population. Europe has advanced much further toward complete land utilization.

The number of examples, with different outside conditions, which all show the same tendency, greatly strengthens the probability of a functional relationship between the two factors. The logical condition of a change in surroundings is satisfied. Moreover, since the probable error decreases with the square root of the number of items in any single computation of correlation, the probable error of the general relationship in this case may be considered to decrease with the square root of the number of diverse groups of cases in which fairly similar correlation appears.

## SUMMARY

It is evident that the dairy industry of Massachusetts has in the past ex-

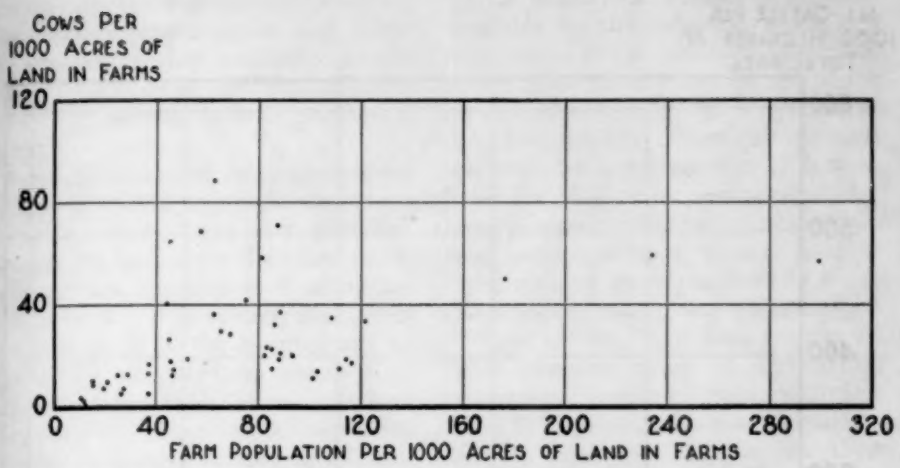


CHART IV—COMPARISON BETWEEN DENSITY OF FARM POPULATION AND NUMBER OF COWS PER UNIT OF FARM LAND IN THE STATES OF THE UNITED STATES

panded and become more efficient while the process of industrialization and urbanization has been in progress.

This improvement has been relatively greater than that in any other New England state with the certain exception of urbanized Rhode Island and the possible exception of Vermont. It is probable, however, that none of the northern New England states has increased its output so much in the past seventy-five years as has Massachusetts.

A period of temporary retrenchment set in in the early part of this century coincident with a decline in the rate of milk consumption.

The counties in Massachusetts which have made the most consistent advance in the industry are two which are well within the urbanized area. Moreover, the eastern counties were slower in entering the retrenchment of the early part of this century than were those at a greater distance from the urban centers.

While isolation and extreme urbanization have caused a decline in some towns, a study of the development by towns shows that the industry has been easily able to survive in those parts of Massachusetts most closely in contact with the urban markets and fully open to interstate trade.

A study of present-day relationships shows a tendency toward the greatest development of the industry in those sections with the most dense human population on the farms (or, in other words, those most influenced by industrial development). This is true in other parts of the nation and of the civilized world as well as locally.

### ECONOMIC INTERPRETATION

These findings do not rest upon any theoretical analysis of the situation. They are based merely upon an analysis of the available statistical evidence. Nevertheless, it must be assumed that such economic results must be based upon the action of economic forces. It then becomes a matter of importance to consider what economic forces have produced these results.

The economic forces bearing upon these conditions are very complex. A theoretical analysis of the situation reveals some forces which operate in the direction of the indicated results

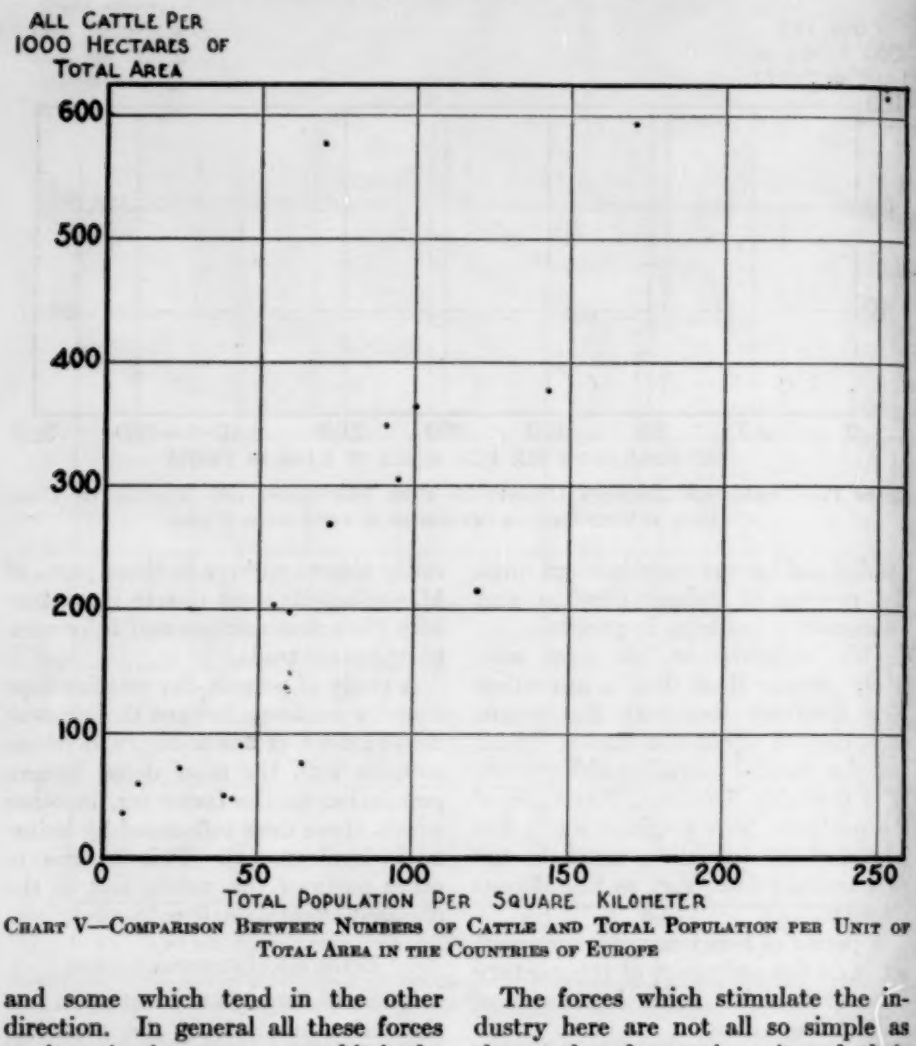


CHART V—COMPARISON BETWEEN NUMBERS OF CATTLE AND TOTAL POPULATION PER UNIT OF TOTAL AREA IN THE COUNTRIES OF EUROPE

and some which tend in the other direction. In general all these forces are in action in every case and it is the resultant of their interplay which appears in the conditions as they exist.

Some forces tend to depress the dairy industry in this region. Among these are the greater cheapness of feed in other regions and the greater opportunity for labor in New England to find profitable employment in the factories. At one time the cheapness of land in other sections was also a depressing force for the dairy industry in this section.

The forces which stimulate the industry here are not all so simple as these other forces, in spite of their greater weight. Among the simple causes are the perishability of milk and various matters which make its transportation relatively expensive. Moreover, since the politically organized public demands milk from dairies open to its inspectors, distance being an obstacle to inspection, there is a greater demand for local milk.

There are other more complex economic forces which throw one type of agricultural industry into one farming

community and another into another. The relative proportion of land, labor and capital readily available greatly affect what type of agricultural enterprise will flourish best in any community.

Grain-growing and sheep-grazing are peculiarly suited to conditions where labor is scarce and land plentiful. Market gardening, on the other hand, demands an abundance of labor per unit of land. It is evident that, since the best lands in the country are no longer free, all good farm areas will be put to use and that the use to which they are put will tend to be that which is most productive in view of all their possibilities. Many individual farmers fail to select the most productive enterprises to suit their local conditions, but in the long run the farmers with the poorest judgments are pushed aside and, roughly speaking, each section of the country is actually put to its most productive use in the light of all economic conditions.

Dairying, especially for market milk production, is one of the farm enterprises which require a comparatively large amount of labor per unit of productive land. Cheapness of feed is helpful, but countries which have developed their animal industries intensively no longer have the abundance of land to produce the surplus of grain which makes feed comparatively cheap. Those regions where land and grain are now cheap would no longer have as cheap land and grain as they do if they were in a position to take up dairying on a large scale. Dairying belongs to an intensive stage of farming requiring much human labor and, hence, a fairly dense farming population.

The density of human population available for the industry, which is a large factor in the location of dairying, seems to be based upon factors which do not change quickly. In place of complete fluidity of human labor, it seems to be a settled rule of human behavior that men congregate near large groups of other men. Our industrial centers attract to and hold in their vicinity large numbers of those who choose farming as a whole or part of their activity. In such regions we have intensive types of agricultural enterprises, among them dairying. Such enterprises, like manufacturing, tend to draw raw materials for their use to the regions where the labor is present rather than to move where the raw material originates.

New England is one of the most densely populated sections of the country and this density may be expected to increase as the industrial activity expands.

## CONCLUSION

The conclusion is ventured that dairying in Massachusetts is on a sound economic basis. It should be able to persist there and in similar economic communities, even near to the urban centers and in competition with interstate trade, so long as local dairymen keep in the forefront of the technique of efficiency in the production and marketing of their product.

Industrialization, with its increased density of population, both in town and in nearby country, does not discourage all types of farm production; some types, at least, are stimulated materially by such economic development.

# Forestry and the Agricultural Crisis

By Raphael Zon
Director, Lake States Forest Experiment Station

IF there is no agreement as to the cure for the farmer's distress, there is comparative unanimity of opinion as to the diagnosis of his ills. The farmer, we are told, is being ground between two economic forces—on one hand, overproduction due to overexpansion of acreage, industrialization of the farm industry, and increased yields, and on the other, decreased opportunities for marketing his products, due to decline in European demand, increasing foreign importations of agricultural products, and decline in domestic consumption.

The Secretary of Agriculture in his report for 1927 sums up the situation in about these words: The crop land in the United States underwent a decline of 13,000,000 acres during the five-year period between 1919 and 1924. Yet for the period from 1922 to 1926, crop production actually increased 5 per cent, animal products 15 per cent, and the productivity of the farm worker 15 per cent above the high production period of 1917 to 1922. Further, in spite of a 6 per cent decrease in farm population, the aggregate agricultural production increased 13 per cent.

## Economic Trends

The predictions of the engineer and statistician contain no immediate remedy. On the contrary, according to these experts the economic trends already now clearly discernible are bound to become more pronounced. The application of power machinery, such as automobiles, auto trucks and tractors, promises to displace more and more the work animals on the farm with the result that the acreage devoted to growing feed for these animals will be reduced. The present replacement of from 5,000,000 to 6,000,000 horses and mules by machinery, which has occurred since 1919, has already done away with the need of between 250,000,000 and 300,000,000 bushels of corn and from 10,000,000 to 11,000,000 tons of hay required to feed these animals. The consumption of rayon and silk, especially for ladies' garments, is bound further to affect the cotton industry. The foreign importations of such products as sugar, hides, skins, wool, flax seed, cheese, coconut oil, tomatoes, molasses, nuts, already amount to about $1,000,000,000 annually. They are equivalent to the production of 60,000,000 acres or about half a million American farms and the competition of tropical countries in the production of vegetable oils, sugars, and starches is only just beginning.

The dietary habits of the people, we are told, are also changing. With the shift of population from country to city and sedentary occupations, there is also a shift from products requiring a large acreage of land to those requiring a lesser acreage. A census of school children, recently taken by the U. S. Bureau of Education, shows that the enrollment in the first grade throughout the country has remained practically stationary throughout the last six years. This may be interpreted as a decline in the birth rate, which together with restricted immigration points to the tendency of the population to become in the near future almost stationary.

The inevitable conclusion of all this is that the farm industry is over-expanded in acreage, and that there are too many people in the farm industry. All the evidence suggests that agricultural production can keep pace with the increase in population without material increase in the present acreage for farm crops.

### DECREASE IN DEVELOPMENT

*If this is true, what is to become of the vast reserve of now idle land and the land that may become released from agriculture through the economic processes now at work?*

Fifteen or twenty years ago any plea for devoting a portion of land to the growing of timber was branded by promoters of agriculture as an attempt at stopping progress and blocking development. There was then no such thing as non-agricultural land. Mountains, deserts, swamps were all potential agricultural land which needed only the addition or subtraction of water to or from them to make them blossom out into bountiful crops.

The Federal Government itself encouraged land settlement through its Homestead Act. The national objective was a self-sufficient agriculture with the majority of the people living upon the land. "Uncle Sam was rich enough to give us all a farm" was a popular slogan. Later, came the state immigration departments and private land companies, which through high pressure salesmanship tried to induce settlers to take up land. As a result of such a policy, timberlands were cut without any thought of using them again for timber production. They were allowed to burn over as each burning was helping to clear the land for agricultural use. In spite of all these efforts, however, the plow was slow in following the axe.

Agricultural development did not keep pace with the cutting off of the forest. During the ten-year period between 1900 and 1910, an average of some 6,400,000 acres was put under cultivation annually, as against 9,400,000 acres of forest cut over. Between 1910 and 1920 only 2,500,000 acres were improved annually as against 10,000,000 acres cut over each year. Whatever agricultural development there was between 1900 and 1920 was largely confined to the treeless and semi-arid lands of the west. In the early 20's, it was estimated that only about 1,000,000 acres were being improved annually, and that was offset to a large extent by the abandonment of farm land in the East and South, while clearing the land of forest was continued at the rate of approximately 10,000,000 acres yearly.

Today instead of a net increase in crop land, there is an actual decrease. The country is littered with abandoned and decaying homestead shacks which tell mute and tragic tales of blasted hopes of thousands of settlers. Over 330,000,000 acres of land, once covered with splendid forests, lie now practically idle awaiting settlers. Yet they do not come—the land companies have come into lean years. There are some 150,000,000 acres of such land in the Southern States; about 45,000,000 acres in the Lake States; and even on the Pacific Coast, a region which was only comparatively recently invaded by the lumber industry, there must be piled up already some 10,000,000 acres of cut-over land, also looking toward agriculture as its ultimate use.

In the face of the economic changes that are taking place in the farm industry, there is very little hope that the vast areas of cut-over land, even if a large part of it is potentially agricultural land, can be absorbed into agriculture in the lifetime of this or even a second generation. The

reverse is more likely to happen. The acreage of farm land may shrink still further.

### RESULTS OF FARM ABANDONMENT

Now, abandonment of farm land on which farmers cannot make a living, when considered as a cold economic fact, disregarding human suffering and discouragement, should tend to bring farm acreage and farm production in better balance with the demand for farm products. In the long run, therefore, it should prove of advantage to the farm industry. This would be true, if the abandoned farm lands and the vast acreage of cut-over land now on the market were put to some productive use. As long as a large part of it remains idle and tax delinquent, it has a depressing effect upon the operated farm land. Townships were organized and self-governing units established, schools were built, and highways constructed in many northern counties of the Lake States when the lumber industry was in progress and many small agricultural settlements were in existence. The settlers worked part of the time in lumber camps and part of the time on their farms in producing hay and foodstuffs for the local markets. As the timber has been cut out and the lumber industry moved away, many of the small farms were also abandoned and the source of taxable wealth of many townships has disappeared. Yet schools and highways must be maintained, indebtedness incurred at the time of prosperity must be met, particularly bonds issued for drainage of swamps for agricultural use, with the result that the local self-governing units are forced to meet their carrying expenses by levying increasingly heavier taxes on the property of the settlers left in the community, and on the small business men in the towns.

Wisconsin is a good agricultural state and may serve as an illustration. When the land becomes tax delinquent, the counties try to sell it for taxes to the highest bidder by offering for sale so-called tax certificates. Such tax certificates on 2,593,163 acres of tax delinquent land, or nearly a quarter of the entire land area of the seventeen northern counties of Wisconsin, were offered for sale at the 1927 tax sale. The certificates on only 18 per cent of this area were purchased by private parties, the remainder being left in county hands since no buyers were available.

The 2,500,000 acres offered for sale for taxes at the 1927 tax sale do not represent the total tax delinquent land in northern Wisconsin. Over a million and a half acres in addition were offered for sale one or more times at the previous six tax sales not included in the tax sale of 1927. Thus, over 4,000,000 acres were offered for sale for taxes one or more times during the last seven years. This area is equivalent to more than half the entire area of unplatted lands of the northern counties that is not in harvested farm crops or sawtimber.

As the area of tax delinquent land has increased in Wisconsin during the past seven or eight years, there has been an appreciable increase in the tax per acre. In one of the towns studied, the tax per acre on all land in 1920 was 54 cents; in 1923 it had risen to 70 cents; and by 1926 it had dropped to 67 cents, an increase still of 13 cents per acre over 1920. The decrease between 1923 and 1926 was not however on operated farm land; it was on land not in farms.

Tax delinquency has already caused some of the northern counties considerable difficulty in balancing their budgets. The larger the area of tax delinquent land—and it is growing

at a rapid rate—the heavier the share of the tax burden which the remaining farm land must assume with the inevitable further reduction in the returns from farming. Tax delinquency, once started, sucks in more and more of the remaining non-delinquent land into its vortex, unless there fortunately happens to be a rich industrial city which becomes the main source of the taxes collected within the county.

What is true of Wisconsin is equally true, even if not in a more aggravated form, of some of the northern counties of Minnesota and Michigan. In Minnesota, at least two northern counties were unable to meet last year the interest on their bonds, and unless the state comes to their rescue must declare themselves bankrupt. I speak of the Lake States simply because I am familiar with this region; the same is undoubtedly taking place in every other forest region of the country.

Taxes on farm lands in the cut-over regions of the Lake States in many cases have practically absorbed farm earnings in years of low farm returns. In many sections, taxes on land are equal to the cash rental of the farm land. Considering farm taxes in 1900 as 100, the index number for farm taxes in 1927 had increased to 253. Taxes on the farms ranged in the year 1923-24 from 17 per cent in North Dakota, 20 per cent in Missouri, to 38 per cent in Colorado and 67 per cent in Michigan of the net property income of the farmer before the tax had been deducted.

The large acreage of idle land unproductive of taxable value acts as a depressive influence on the returns of the farmers in the cut-over region. It is like a reserve army of unemployed which depresses the wages of those who are employed. As no taxation wizard has yet discovered a method by which the owner of unproductive land, having no market value, would be willing to pay taxes on it, the only solution out of the dilemma is to convert such land into land producing taxable wealth. If such land is not needed and has no value for farming, what, then, is it good for?

### WHAT CAN BE DONE

If the production of farm crops is in excess of the actual demand, there is one product of the soil, the supply of which is constantly diminishing and the demand for which is constantly increasing. This product is wood. The mere fact that our sawmills may produce temporarily an excess of lumber over what can be absorbed is no indication of the actual timber situation in the country. It simply means that under the pressure either of heavy taxes on standing timber or the necessity of meeting interest on timber bonds or other indebtedness, or the competition between the several lumber producing regions of the country, more timber is cut from the stored timber supply and a larger quantity of lumber temporarily forced upon the market than is needed. It is an undisputed fact that the timber supplies are rapidly disappearing, and that within about twenty or thirty years even the Pacific Coast may be depleted of most of its standing timber.

It is estimated that some 22½ billion cubic feet of timber, or the equivalent of 53 billion board feet of lumber, is being annually cut from our forests to cover our demands for fuelwood, lumber, ties, pulp wood, cooperage, and many other products. If to this is added close to two and one-half billion cubic feet of wood that is being annually destroyed by fire, insects, and windfall, the total annual drain upon our forests is close to 25 billion cubic feet, or 60 billion board feet.

The annual growth of timber, on the other hand, has been estimated to be a little over six billion cubic feet, or less than one-fourth of what is being annually cut and destroyed by fire and other causes. At the current per capita consumption, a population of about 150,000,000 people in 1950 would require annually about 32 billion cubic feet. The average production per acre on the 250,000,000 acres of forest land, on which timber of one kind or another is growing, is 24 cubic feet. At such a yield, to meet in perpetuity even our present requirements of only 25 billion cubic feet a year, about *one billion* acres would be needed. The withdrawal of such a large area for forest purposes would not only take off the market all the present idle, cut-over land, but it would cut drastically into the acreage of plow land. The withdrawal of such an acreage is impossible; nor is it necessary.

The yield of 24 cubic feet of wood per acre is extremely low. With better fire protection and the application of simple methods of forest culture, this yield can be doubled or even trebled. Even then, it would be still below the standard of production per acre which is obtained in European countries through more intensive timber culture. Furthermore, the present per capita consumption of wood—212 cubic feet—is one of the largest of any country in the world. It is reasonable to expect that this consumption, as a result of increasing prices and the growing number of substitutes for wood, is bound to decrease.

With increased yields per acre and decreased per capita consumption, an area of 500,000,000 acres, devoted to timber growing as a crop, would probably be enough to meet in perpetuity our present and even our future domestic needs for timber. It should be, however, an area not less than 500,000,000 acres to begin with, at least for the first two or three decades, as yields from forest land cannot be raised over night. Such an acreage is available in this country.

According to computations made by the Land Utilization Committee of the United States Department of Agriculture,[1] after all allowances were made for the acreage of crop land that may be needed by 1950, allowances for the acreage of semi-arid and humid pasture, and for the expansion of area required for cities, roads, etc., there still remain about 496,000,000 acres of surface not required for any other use than forests. With some deductions for swamps and too dry locations, unsuitable to tree growth, this acreage is probably not more than 483,000,000 acres, or almost exactly the area now classed as forest land. This area includes at present the bulk of the non-productive, tax-delinquent land. What is involved, then, is to withdraw definitely these 483,000,000 acres from any land settlement, and devote them *effectively* to timber production, so that the land may be earning not only taxes but also a fair profit on the investment.

This economic process is already under way. We are witnessing today in this country the creation of a new public domain, destined to be largely a forested public domain. The former process of disposing the Federal public domain is now being reversed. The Federal Government itself, since 1911, has embarked upon the purchase of cut-over land for national forests. Close to 3,000,000 acres have already been purchased, mostly in the eastern states, and the present plans call for the acquisition of several million acres in the Lake States. Land which but a few decades ago was given away by

[1] "The Utilization of Our Lands for Crops, Pasture, and Forests," Separate No. 896, from U. S. Dept. of Agriculture Yearbook, 1923.

the Federal Government as grants to the states, and by the states passed on to private lumber companies, which stripped it of its timber, is now in many cases being bought back by the Government for National Forests at a cost of from $1.00 to $2.50 per acre.

While the Federal Government carries out the acquisition of such land as a deliberate policy, although on a very modest scale, the states and counties are acquiring a public domain often much against their will. The cut-over lands, as they are being abandoned for non-payment of taxes, revert in some cases directly to the states, in others to the counties. In Michigan, over a million acres of such tax-delinquent land should have become by law state forests a number of years ago. Some 7,000,000 acres of such land are in the process of reverting to the state. Northern Minnesota has some 6,500,000 acres of delinquent and forfeited land of which the state, sooner or later, must become the owner. In Wisconsin, the northern counties are confronted with 4,000,000 acres of such delinquent land. Some of them are already converting this land into county forests.

In practically all cases, the Federal and state governments are contributing some funds in lieu of taxes to the support of the local governments within the territory in which the new public domain is created. The Federal Government pays back to the township or county 35 per cent of all gross receipts of the National Forest located within their boundaries. In Michigan the state pays five cents an acre annually for all the land that reverts to it as state forests.

To prevent the rapid flow of abandoned, cut-over land into state ownership, several states have enacted special forest tax laws. They are in the nature of deferred taxes on cut-over land, and their purpose is to encourage the private landowners to keep the lands in forest production. The private owner pays a nominal annual tax of from five to ten cents an acre to the township or county for lands registered under these laws, the State pays a similar amount in the hope of recouping itself from a yield tax at the time the timber is harvested within the next 50 years.

The state of New York, where farm lands are being abandoned at the rate of about 200,000 acres every year, has deliberately set out on a policy of acquisition of the abandoned farm lands for timber growing. Some states, like Pennsylvania and, again, New York, are issuing state bonds for the acquisition of such land into public ownership.

### A Forest Policy

Thus, economic necessity dictates a way out of the dilemma of surplus idle land and shortage of wood. This economic process is inevitable. It has just started, it is still desultory and is not always welcome by the states. It should become the economic land and forest policy of the time. The acquisition of cut-over land by the Federal Government needs be expanded on a large scale. The states, instead of accepting grudgingly the tax-delinquent land and often doing nothing with it, should deliberately encourage this process and energetically apply themselves to making this land forest productive. The creation of the new public domain will help to relieve the agricultural distress only on the condition that the land is made to produce wealth—in this case, timber. It is a slow process and may necessitate expenditure for the rehabilitation of the land, but then the agricultural situation, too, will not be cured in a day.

It is pertinent at this point to raise

the question whether by devoting a large acreage to growing timber we are not creating a situation which in the next 30 to 50 years may become as troublesome as the agricultural overproduction of today. What guaranties have we that with the rapid shift in the use of raw materials by the industries, there will be as great a demand for forest products in 50 years from now as there is today?

The history of forestry does not lack instances when the bottom dropped out of the market for timber as the result of economic changes. The most notable example is the period just preceding the coming of coal and railroad transportation into use. Wood was then the chief source of fuel and getting scarce. Wood scarcity gave a great impetus throughout central Europe to planting of forests, chiefly for fuel. When coal replaced wood as a fuel and railroad transportation made it accessible to regions where it was lacking, many forests became almost valueless as the market for fuel wood had disappeared. Is it not possible that something similar may happen 30 years from now to the forests which we are raising today?

We must candidly face such a possibility. The demand for wood in the form in which it is commonly used today may diminish or entirely disappear. Yet wood, since the early civilization, never ceased to play an important industrial rôle in one form or another, and with each successive stage of civilization its economic importance increased. Cellulose and lignin, the two substances which make up wood, are now assuming great economic importance. They are the basic materials of lacquers, rayon, explosives, photographic films, celluloid, ethyl alcohol, and a vast multitude of other things.

The foundation of any civilization is organic matter. In the past organic matter was used in the form in which it was found in nature. Houses in the early days were built, for instance, direct from logs. Papyrus leaves were used direct for making paper. Later the logs were sawed into lumber. Soon we may be making boards out of pulp and of any width, length, strength, and impart to them any quality that may be desired. The foundation of all these products must still be organic matter. There is no danger that human civilization will ever be able to get away from using organic matter as raw material, and no plant produces so cheaply and en masse cellulose and lignin as forest trees.

Several pulp and paper mills, with large investments in their plants, have been looking into the future source of their raw material. They ended by devoting forest land to growing trees as the future supply for their mills.

But let us assume for the sake of argument that wood will cease to be a commodity needed by our industries, there still remains the forest as the ameliorator of climate, as the agent controlling erosion and streamflow, as the habitat of wild life and the most natural ground for human recreation. The latter assumes an increasingly greater importance as our industrial life becomes more complex and the leisure of the masses, due to shorter working hours, increases. The present means of rapid transportation—automobiles and airplanes—bring even the remotest forests within easy reach of the many dwellers of our big industrial cities. All present indications are that the forests will never cease to be an indispensable condition of human life and that the dedication to timber culture of all land which cannot be profitably farmed and which is adapted by nature for that purpose is a sound national land and forest policy.

# Recent Trends in Export Trade in Agricultural Products

By E. G. Montgomery
Chief, Foodstuffs Division, United States Department of Commerce

EXPORT trade in agricultural products differs from that of many other commodities in that they are staples of long standing, the trade is old and well established throughout the world. Primarily the exports of the products are based on the necessity of the world for standard foodstuffs and the selling is mostly on a price basis. In other words, if Argentina can offer wheat of a similar grade for two cents a bushel cheaper than the United States, then it will get the order, as about the only selling argument you have for standard food products is the selling price. For this reason our largest exports are usually in years when we have the largest crop and generally when the prices are lowest. Conversely, high domestic prices usually mean low exports. Of course there are a few exceptions to this since most of these products take an international price level based on the world production and our exports are based on whether our domestic prices are higher or lower than world prices. The important changes which have taken place in recent years affecting our export trade can be briefly summarized.

The two great export food products are wheat, including flour, and meat products.

## Wheat Situation

Briefly, the wheat situation before the world war had reached a fairly stable condition due to generally stable prices over a period of years. Before the war the great wheat exporters were the United States, Russia, Argentina, Canada and Australia. When it was apparent that Russia would not return to surplus production for some years after the war it seemed that this would be of considerable advantage to the United States export trade. However, the rapid increase in production in Canada, Argentina and Australia since 1920 is about twice as much as the pre-war Russian exports. To put it more definitely, the pre-war production of Canada, Argentina and Australia were approximately 430,000,000 bushels. In 1920 these countries produced collectively 565,000,000 bushels, and the 1928 crop is estimated at 880,000,000 bushels, or an increase of 315,000,000 bushels over 1920. The average pre-war exports of Russia were 164,500,000 bushels. The increased production of the Western Hemisphere since 1920 is the more remarkable when we consider that during a good part of this period prices have been relatively low. In the United States we have also made an increase of some 200,000,000 bushels over pre-war production, but there has been very little change during the past eight years. This large increase in the newer wheat fields of the world has tended not only to keep down the price of wheat during the past few years but has materially restricted expansion in the United States. There are prospects that this increase will continue for some time to come as there are still large unexploited areas of good wheat land, especially in Canada, and increased production will probably continue. As wheat production in

Canada, Argentina and Australia is lower in cost than in the United States, this would seem to indicate relatively low world price levels for some years to come, and not much encouragement for the United States to produce a large exportable surplus.

### MEAT PRODUCTS

In the pre-war period there was a fairly stable trade in meat products consisting principally of pork products from the United States to Europe, a certain amount of lamb and mutton from Australia and New Zealand to Europe, and some South American beef. During the war, and for several years following, this country had an immense increase in its exports of pork products. This was largely due to the decreased hog production of Europe. In round numbers the hog population of Europe before the war was estimated to be around 88,000,000. If we take the nine countries on which statistics are fairly complete we find that the pre-war average was about 44,000,000 hogs. This number decreased by very nearly one half during the war and by 1923 had recovered to only 33,000,000, still approximately one fourth below pre-war normal. However, by 1928 these countries had approximately 44,000,000 hogs, or practically pre-war normal. There was also an increase in some of the other countries of less importance in production and it is probable that the present hog population of Europe (excluding Russia) is higher than in pre-war years. The effect of this increase since 1923 has been very marked on our export trade. In 1923 we exported approximately 2,000,000,000 pounds of hog products, which gradually dropped to 990,000,000 pounds for the year 1927, and has been about the same for 1928.

Another important factor has been the increase in use of vegetable fats in Europe. Lard has always been our most important export product, but the vast improvement in preparing margarine and cooking fat from vegetable oils has introduced a strong competitor with lard throughout the Continent.

Just what trend hog production in Europe will take in the future is difficult to forecast but is based primarily on production of cheap feed. Potatoes are used extensively and these can be produced at a very low cost. Argentine corn, at relatively low prices, is increasing in amount, and exports of this commodity have been of great help to the European hog producer. As far as we can see at present Argentine corn production will continue for many years to come. Argentine corn has largely taken the place of the old exports of cheap barley from Russia, which before the war was an important feed grain for Europe.

There is little prospect of hog production developing in either South America or any of the newer countries on a basis competitive with the United States, hence, it is the hog production of Europe that will largely determine the export demand for American meat products in the near future.

In the minor food products such as canned fruits and vegetables, fresh fruits and dried fruits, we have made substantial gains in recent years, largely due to the great technical advance in this country in the low cost of production of these products. Our immense home market for these commodities has built up low cost production in the United States and there is little prospect of any very strong competition for some years in the future.

Our exports of poultry and dairy products are unimportant but with the

rapid increase which is taking place it is a question whether we will not be on an export basis with dairy products within a very few years. This is a market that is already pretty well crowded. Dairy products are produced not only cheaper in Europe, but also especially in New Zealand, the principal supplier at present. Fortunately, our domestic market has also increased rapidly for both dairy and poultry products and has absorbed production up to the present time. The domestic market is much higher than the European market and prices will have to be relatively very much lower if we are ever to export dairy and poultry products in large quantities.

To sum up, the rapid expansion of wheat production in the Western Hemisphere and the recovery of hog production in Europe have tended to reduce the exports of the United States in recent years. There is good reason for believing the expansion of wheat culture will continue for some years and that probably Europe will at least be able to maintain its present hog production in the future, particularly if it can continue to buy low priced Argentine corn and other feeds at present prices.

# Trends in Agricultural Exports

By H. R. Enslow

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AT a time when farm relief is receiving so much attention as a major issue before the nation, a discussion of agricultural exports and imports becomes of especial interest—all the more so in view of the fact that the tariff is about to be revised and that the question of protection of agriculture is sure to occupy a very prominent position in the battle of interests.

This article attempts a purely statistical study of the trend of agricultural exports, and will endeavor to answer such questions as the following: What is the volume and value of agricultural products exported from the United States? How does the present outward flow compare in volume with that of by-gone years? How does the volume of imports compare with that of the exports? Which are the more important among the products exported? Are certain products of greater or less relative importance than formerly in the stream of exports? How do the amounts exported compare with the total amounts produced in the United States? In what direction is the main flow of agricultural exports?

## Yearly Average Value

Table I shows the yearly average value, in thousands of dollars, of the exports and imports of agricultural products for five-year periods, 1852 to 1926. It also shows the relative importance of agricultural products in the volume of trade:

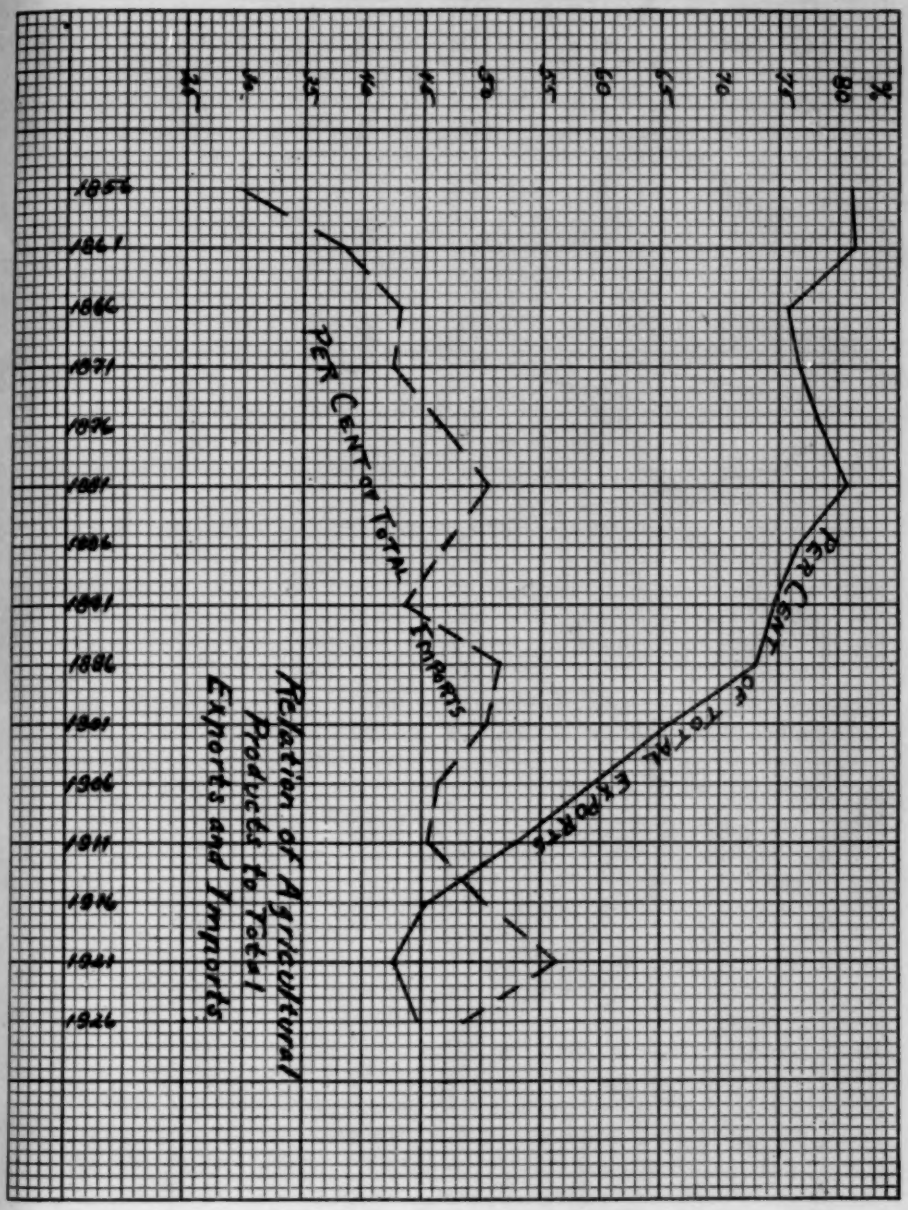
TABLE I—Foreign Trade in Agricultural Products *

Years ended June 30

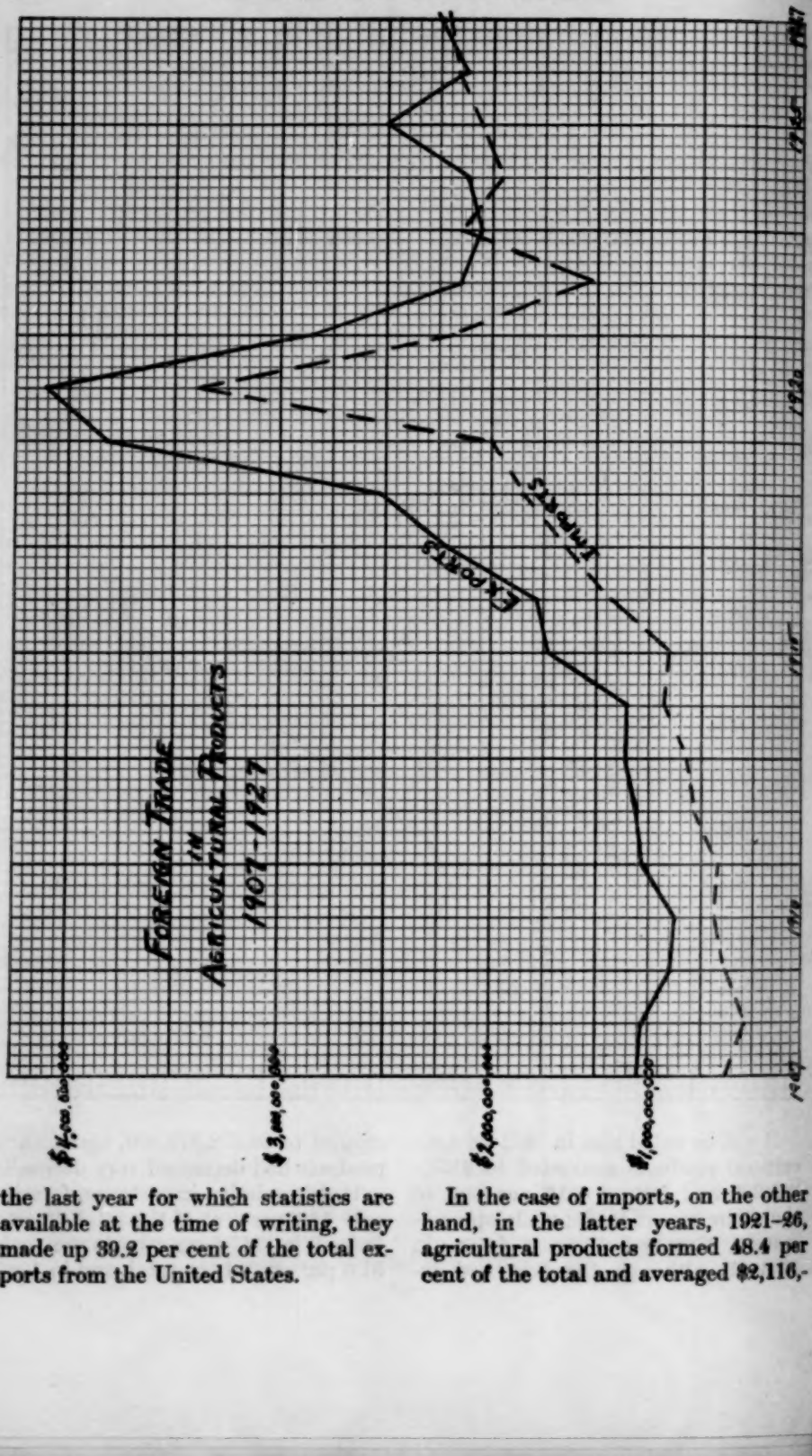
(All figures, except percentages, in thousands of dollars)

| Year | Agricultural Exports (Domestic) | Per Cent of All Exports | Agricultural Imports | Per Cent of All Imports |
|---|---|---|---|---|
| 1852–56 | $164,895 | 80.9 | $77,847 | 29.1 |
| 1857–61 | 215,709 | 81.1 | 121,018 | 38.2 |
| 1862–66 | 148,866 | 75.7 | 122,222 | 43.0 |
| 1867–71 | 250,713 | 76.9 | 179,774 | 42.3 |
| 1872–76 | 396,666 | 78.5 | 263,156 | 46.5 |
| 1877–81 | 591,351 | 80.4 | 266,384 | 50.4 |
| 1882–86 | 557,473 | 76.3 | 311,708 | 46.8 |
| 1887–91 | 573,287 | 74.7 | 366,950 | 48.3 |
| 1892–96 | 638,748 | 73.0 | 398,332 | 51.6 |
| 1897–1901 | 827,566 | 65.9 | 376,550 | 50.2 |
| 1902–06 | 879,541 | 59.5 | 487,881 | 46.3 |
| 1907–11 | 975,399 | 53.9 | 634,571 | 45.2 |
| 1912–16 | 1,256,452 | 45.1 | 924,099 | 50.1 |
| 1917–21 | 2,859,558 | 42.7 | 1,972,707 | 56.1 |
| 1921–26 | 2,472,379 | 44.7 | 2,116,760 | 48.4 |

* Figures from *Statistical Abstract*, 1928, p. 608.




It will be noted that in 1852–56 agricultural products amounted to $164,895,000 and formed 80.9 per cent of the entire export trade; while approximately seventy-five years later, in 1921–26, although the flow had increased to $2,472,379,000, agricultural products had decreased very decidedly indeed in relative importance, forming only 44.7 per cent of the total exports. Indeed, in 1917 farm exports were only 31.6 per cent of the total, and in 1927,




the last year for which statistics are available at the time of writing, they made up 39.2 per cent of the total exports from the United States.

In the case of imports, on the other hand, in the latter years, 1921–26, agricultural products formed 48.4 per cent of the total and averaged $2,116,-

760,000—a decided contrast with the situation in 1852–56, when agricultural products formed only 29.1 per cent of the total imports and were valued at $77,847,000. In the year 1920 agricultural products composed approximately 60 per cent, 59.7 per cent to be exact, of all imports; while in the seven years 1915–21 such products without exception made up more than half the total imports.

While there are variations from year to year, especially in the case of agricultural imports, there is in evidence a decided lessening of the relative importance of agricultural products in the export trade of the United States; and at the same time a perhaps less emphatic, but nevertheless observable increase in the relative importance of agricultural products in the import trade. While, of course, the situation has not developed sufficiently for conclusions of any value to be safely drawn, these facts when taken in connection with the present approximate equality of imports and exports of agricultural products are not without significance. The situation is set forth in the graph on page 82.

### INCREASE IN LAST TWO DECADES

Thus far we have considered the broad sweep of the past seventy-five years. Let us now look at the period of the last twenty years. The graph, Foreign Trade in Agricultural Products, 1907–27, indicates how both exports and imports of agricultural products have shown a steady increase in the last two decades, the sudden upward leap during the war period and the subsequent depression not disturbing the main trend. The peak of 1919 and 1920 is significant as showing what really stupendous amounts can be furnished when occasion demands; exports of agricultural commodities were actually doubled.

It is striking that in 1923 and again in 1926, more agricultural products were imported than were exported. True, the difference was very slight (in 1923, imports were $1,905,245,000 and exports $1,799,168,000, and in 1926, $1,918,266,000 and $1,891,739,000); but in 1927 the margin in favor of exports was only a narrow one ($1,907,851,000 as against $1,906,150,000). It would seem quite possible that the excess of imports of agricultural products may perhaps become permanent. This, of course, would be no cause for alarm because of the non-competing nature (in the main) of the commodities in the two classes. It must be recognized that there *is* competition in many instances; but this brings in the question of protection and of conflicting interests which must be avoided in the present article which attempts only to set forth a brief statistical outline of the export situation.

Table II shows the value of domestic exports of agricultural products by major groups. It will be noted that cotton is the most important export, followed by grains, and animal products. All the groups follow, in the main, the trend of the total agricultural exports, showing a steady growth with a wartime peak.

In the years 1910–14, cotton made up more than half of the total value of the exports of agricultural products, *i.e.*, 53.2 per cent. In 1919, in spite of the fact that cotton exports were double those of pre-war years, the great product of the South had greatly decreased in relative importance and composed only 27.7 per cent of the total. Grains, which accounted for 35.8 per cent of the total agricultural exports in 1921, in 1925 fell to 16.4 per cent; but have since rallied, and in 1927 made up 23.5 per cent of the total. Animals and their products, which averaged 14.6 per cent of the total for the years 1910–14, rose

TABLE II—VALUE OF DOMESTIC EXPORTS OF AGRICULTURAL PRODUCTS*

By Major Groups

(In millions of dollars)

| Calendar Year | Cotton | Grains and Preparations | Animals and Products, Edible | Tobacco | Vegetables, Fruits, Nuts |
|---|---|---|---|---|---|
| 1910–14 (fiscal) | $551.9 | $147.3 | $151.8 | $44.8 | $35.0 |
| 1913 | 575.5 | 197.4 | 158.8 | 52.9 | 40.5 |
| 1919 | 1,137.4 | 935.9 | 1,017.5 | 260.0 | 175.3 |
| 1920 | 1,136.4 | 1,085.9 | 472.8 | 245.5 | 117.9 |
| 1921 | 534.2 | 758.4 | 309.1 | 205.1 | 90.4 |
| 1922 | 673.3 | 516.0 | 262.2 | 146.5 | 93.6 |
| 1923 | 807.1 | 311.4 | 309.6 | 153.4 | 87.7 |
| 1924 | 950.6 | 433.8 | 275.5 | 164.1 | 117.1 |
| 1925 | 1,059.8 | 351.8 | 271.3 | 153.8 | 121.1 |
| 1926 | 814.4 | 355.7 | 238.2 | 136.9 | 132.6 |
| 1927 | 826.3 | 443.8 | 182.6 | 139.7 | 143.6 |

* Source: *Statistical Abstract*, 1928, p. 608.

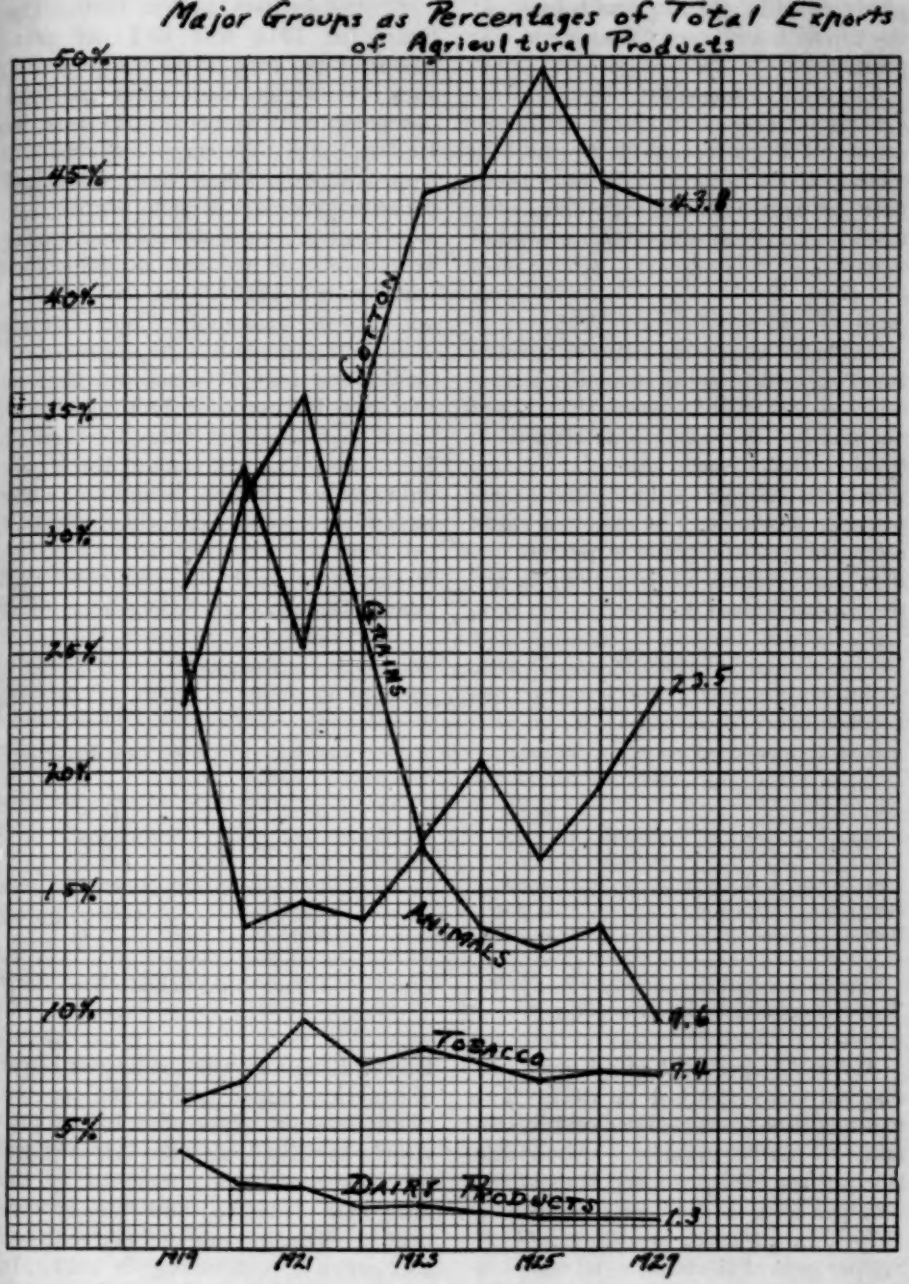
to almost 25 per cent of the total agricultural exports in 1919, have been at about the pre-war proportion in recent years, and in 1927 fell to less than 10 per cent. Tobacco has been consistently hovering between 5 and 10 per cent; and dairy products and eggs, taken together, have made up considerably less than 5 per cent of the total exports of agricultural commodities. More detailed information as to the relative importance of the various groups of products may be seen in Table III and in the graph which accompanies it.

A comparison of quantity and price with value should prove of interest. The *Statistical Abstract*, 1928, page 609, gives an index showing that, considered as a whole, agricultural exports have increased in all three respects when 1927 is compared with the average of 1910–14. Value bears the ratio of 182, price 141, while quantity is 129. Comparable ratios for 1919 as related to 1910–14 emphasize war-time conditions in a striking way: value, 395; price, 256; and quantity, 154.

When the major groups of agricultural exports are considered individually, we see that for 1927 as compared to 1910–14 animals and edible products have the lowest quantity ratio, 92; cotton next lowest, with 111; tobacco,

TABLE III—MAJOR GROUPS AS PERCENTAGES OF TOTAL EXPORTS OF AGRICULTURAL PRODUCTS

| | 1913 | 1919 | 1920 | 1921 | 1922 | 1923 | 1924 | 1925 | 1926 | 1927 |
|---|---|---|---|---|---|---|---|---|---|---|
| Cotton | 50.3 | 27.7 | 32.9 | 25.2 | 35.7 | 44.3 | 45.0 | 49.6 | 44.8 | 43.8 |
| Grains and preparations | 17.2 | 22.8 | 31.4 | 35.8 | 26.1 | 17.1 | 20.5 | 16.4 | 19.5 | 23.5 |
| Animals and products | 13.8 | 24.8 | 13.6 | 14.6 | 13.8 | 17.0 | 13.5 | 12.7 | 13.1 | 9.6 |
| Tobacco | 4.6 | 6.3 | 7.1 | 9.6 | 7.7 | 8.4 | 7.7 | 7.1 | 7.5 | 7.4 |
| Vegetables, fruits, nuts | 3.5 | 4.2 | 3.4 | 4.2 | 4.9 | 4.8 | 5.5 | 5.6 | 7.2 | 7.6 |
| Dairy products and eggs | .6 | 4.1 | 2.8 | 2.6 | 1.8 | 1.9 | 1.6 | 1.4 | 1.4 | 1.3 |
| Miscellaneous | 9.8 | 9.8 | 8.6 | 7.6 | 8.3 | 6.3 | 6.3 | 6.8 | 6.1 | 6.5 |




130; grains and preparations, 210; dairy products and eggs, 267; and vegetables, fruits, and nuts highest, with 295.

Price ratios, 1927 as compared to 1910–14, show animals and products again lowest, 131; cotton, 135; vegetables, etc., 139; grains, 143; dairy

products and eggs, 151; and tobacco at the top with a ratio of 239 over pre-war price.

The similar ratios for value, 1927 as against 1910–14, show animals still lowest with 120; cotton next to lowest with a ratio of 150; tobacco, 312; dairy products and eggs, 402; and vegetables, etc., most favorably situated with a ratio of 410.

### WHERE THE EXPORTS GO

Table IV shows the ratio of agricultural exports to total agricultural production. It will be seen that about one-sixth of the total value of agricultural products is sent abroad. During war-time a larger proportion was exported. Post-war years show a slight increase over the pre-war percentage. For about fifteen years preceding the war the ratio had declined.

1927, 25.6 in 1923, 31.2 in 1919. The figure for 1914 was 19.1 per cent. About 50 per cent of the rye produced goes into foreign trade while less than one per cent of the corn grown in the United States was exported in 1927. Approximately 40 per cent of the leaf tobacco produced is sent abroad. A very large proportion of cotton raised is exported: 62.6 per cent in 1914; 45.1 per cent in 1919; 48.7 per cent in 1923; and 60.6 per cent in 1927.

Statistics given in the *Yearbook of Agriculture* for 1927 indicate that in that year Europe took 71.2 per cent of the wheat exported from the United States and 45.3 per cent of the wheat flour. The United Kingdom alone took 25.2 per cent of the wheat and 12.9 per cent of the wheat flour. The Netherlands took 11 per cent and France 10.3 per cent of the wheat. The

TABLE IV—AGRICULTURAL PRODUCTION AND EXPORTS *

(In millions of dollars)

| Year | Production | Exports | Per Cent Exported |
|---|---|---|---|
| 1909 | $6,100 | $903 | 14.8 |
| 1914 | 7,500 | 1,113 | 14.8 |
| 1919 | 15,700 | 3,579 | 22.7 |
| 1921 | 9,200 | 2,607 | 28.3 |
| 1923 | 11,300 | 1,799 | 16.0 |
| 1925 | 12,400 | 2,280 | 18.2 |

* Production statistics are from "Foreign Trade of the United States in the Calendar Year 1927," Trade Information Bulletin No. 537, p. 9.

About 5½ per cent of all meat production was exported in 1927. This was a decline from 13.6 per cent in 1919 and 10.1 per cent in 1923. About one-third of the lard produced is exported: 28.1 per cent in 1914, 38.7 per cent in 1919, 38.6 in 1923, and 30.4 in 1927. Six per cent of the condensed milk production was shipped abroad in 1927—an increase over 2.6 per cent for 1914; but a very great decline from 38.8 in 1919. About a quarter of the wheat produced is exported: 26 per cent in

United Kingdom was the largest buyer of American sugar, taking 32.5 per cent of the amount exported. In the previous year, 1926, an even larger share, 43.7 per cent, was purchased by the Kingdom. Uruguay and Norway were next in order, buying 16.7 per cent and 13.2 per cent, respectively, in 1927. In purchases of American leaf tobacco the United Kingdom was first, taking 30 per cent of the total exports. China was next, and bought 15 per cent. Cuba bought 45 per cent of our exports

of potatoes, while Canada took 28 per cent.

Europe took 78 per cent of the American cotton exports; Japan took 14.6 per cent; Germany 25 per cent; and United Kingdom 23 per cent. The United Kingdom took half of the bacon exports and other European countries took an additional 25 per cent. Cuba and Argentina together buy two-thirds of the eggs sent abroad. Cuba takes almost a quarter of our cheese exports.

Europe, especially the highly industrialized section of northwestern Europe, is by far the best customer of the American farmer. Her predominance as a buyer of American agricultural products is very great. A study by H. M. Strong, of the Bureau of Foreign and Domestic Commerce, gives the following table which shows the importance of Europe as a purchaser of American agricultural exports: [1]

Before the war an average of 84 per cent of the value of all farm exports went to Europe. In 1919, when food was needed in Europe and prices were high, 87 per cent was the European share of agricultural exports from the United States. This was the largest proportion since the years 1907 to 1909, when Europe took slightly more than 87 per cent of our agricultural exports. The average proportion of these products going to Europe during the three years, 1920–22, was only 77 per cent, or considerably smaller. . . . This decrease in the percentage of agricultural products going to Europe is compensated for by gains in our trade with North America and Asiatic countries, indicating a shift in our export trade in these products compared with pre-war trade.[2]

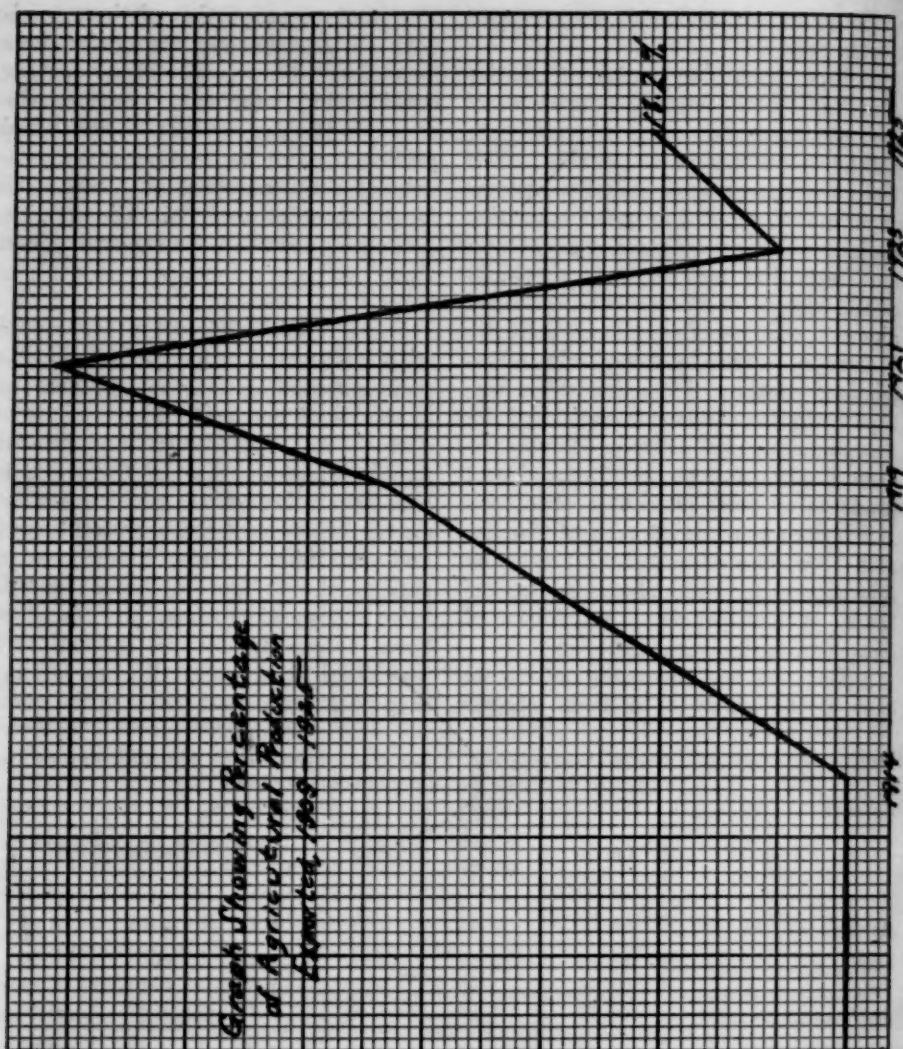
Eastern Asia will eventually compete with northwest Europe for first place as an importer of agricultural products for food and of raw materials required in its factories. This largest and densest population of any part of the world is based upon intensive agriculture. Industry has been of the household type, and standards of living have been, in general, low. The existence of this large aggregation of people, many of them possessing unusual manual skill and a high degree of intellectual ability, is to be an important factor in the manufacturing development of the Far East. . . . This region possesses large resources of raw materials and many advantages for manufacturing and an effective demand for manufactured products is developing. The higher buying power of an industrial group will create a demand for foodstuffs and other agricultural products. . . . The effective demand, the fuel and other

TABLE V—PER CENT WHICH AGRICULTURAL EXPORTS TO EACH GRAND DIVISION ARE OF THE TOTAL VALUE OF ALL AGRICULTURAL EXPORTS

| Year | Europe | North America | Asia | South America | Oceania | Africa |
|---|---|---|---|---|---|---|
| Average 1910–14..... | 83.90 | 10.22 | 3.41 | 1.28 | 0.72 | 0.46 |
| 1920..... | 78.63 | 12.13 | 5.70 | 1.52 | 0.55 | 1.47 |
| 1921..... | 76.32 | 14.27 | 7.15 | 1.05 | 0.59 | 0.62 |
| 1922..... | 76.56 | 13.86 | 7.02 | 1.13 | 0.63 | 0.80 |
| Average 1920–22..... | 77.20 | 13.40 | 6.60 | 1.20 | 0.59 | 0.90 |

[1] Trade Information Bulletin No. 177: "Distribution of Agricultural Exports from the United States," January 28, 1924, p. 6.

[2] *Ibid.*




mineral resources, the accessibility to raw materials, the abundant supply of labor with inherent skill and considerable mental ability destine this area of eastern Asia to be one of the world's great manufacturing regions, rivaling northwest Europe in exercising a demand for agricultural products. Except for Siberia, Australia, and Canada, no nation is better located than the United States to share in this market.[3]

[3] *Op. cit.*, pp. 29–31.

# Tariff Handicaps

By James E. Boyle
Professor of Rural Economy, Cornell University

SINCE the mobilization of the American farmers into the American Farm Bureau Federation in 1919 there has been a gradually increasing expression of agrarian discontent with our protective system. This discontent has many forms and vehicles of expression. The nation-wide organizations of farmers, such as the Grange, the Farmers' Union, and the Farm Bureau Federation, in their annual meetings devote a share of their attention to the tariff. The farm press reflects farmer sentiment. One southern farm paper, for instance, in its issue for October 15, 1928, refers to farmers and protection in these words:

> It does not seem at all fair that they should be compelled to sell in the cheapest market in the world, and buy in the highest market in the world.

This quotation expresses in a few words the feeling of farmers generally, that protection is of, by, and for the manufacturer, and that the farmer is a victim, not a beneficiary of the system.

The editor of a northern farm paper, in addressing the Indiana Farm Bureau Federation, put the farmers' case in these words:

> However, we must remember that the tariff is always a selfish log rolling proposition, and go into the fight to get all we can. If we fight hard enough and get our fair share of the tariff plunder, it may be that the industrial interests of the United States will wake up to the true significance of the tariff.

This challenging of our protective system by the farmers has been going on, here and there, sporadically for the past one hundred years at least. But apparently never before has there been such a unanimous feeling on the part of the farmers against the tariff as at the present time. And this feeling exists in the face of the fact that our present tariff (Act of 1922) has placed ninety-nine agricultural commodities on the protected list, and the farm bloc practically wrote its own schedules into the tariff. Still the farmer feels cheated, out-traded, and underprotected as compared with industry. The slogan, "Protection to all or protection to none," is gaining a wide circulation.

## Farm Bureau Study

The organized farmers have thus far made but one tariff study aiming to appraise the total effect of a protective tariff on the income and expenditures of the farmers of the country. This study was made by the Department of Research of the American Farm Bureau Federation, and was published in its official organ in Chicago, January 11, 1923.

This study found there was more cost than gain in the tariff. The statistical calculations made led to the conclusion that the net loss to agriculture was $300,000,000 a year. The following method of attack was used in arriving at this conclusion:

First, a study was made to determine to what extent farmers as producers are benefited by import duties on their products through resultant increases in market prices. Second, a study was made to determine approximately the increase in the cost of all commodities purchased by the farmer whether agri-

cultural or industrial products, attributable to the tariff. Studying the agricultural products item by item, the Department of Research came to the conclusion that the tariff actually increased the price of these commodities by an average of 2 per cent. The farmer's share of this increase was estimated at 25 per cent. In other words, on a total farm production of $19,245,000,000, the tariff increase in price amounted to $392,000,000. Of this increase the farmer paid $95,000,000. It was further estimated that the farmers as producers gained from the tariff-caused price increase a sum amounting to $124,800,000. This left a net gain to farmers from the agricultural tariff schedule of $30,000,000, in round numbers.

Turning now to industrial products, we find that the Research Department considered the data lacking for calculating closely the effects of the tariff on price. To simplify matters, therefore, the price increment was assumed to be the same as in agriculture, namely, 2 per cent. Assuming further that all industrial goods produced in the United States were consumed in the United States, and using the estimate of $65,000,000,000 as the total output of domestic industrial goods, the tariff increment in price was found to be $1,323,000,000. The farmer's share of this increment was taken as 25 per cent, or $331,000,000. Subtracting the $30,000,000 net gain from agricultural tariff, the farmer was found to be out of pocket a net amount of $301,000,000 a year. The Research Department frankly admitted the difficulty, if not the impossibility, of finally getting any accurate statistical measurement of the influence of tariff on price. Since price is made up of many factors and tariff is but one of these factors, the difficulty inherent in this problem is apparent.

Some additional explanation is needed concerning this Farm Bureau study before other aspects of the problem are considered. The wheat tariff was considered as operative only for hard spring wheats, and then only in those years when we had a scarcity of this class of wheats. In other words, prices to the American spring wheat farmers were raised in 1921 and 1922, but not in 1923. The tariff on corn was considered of little significance. "The duty on corn," says the report, "may occasionally be a minor factor when conditions favor imports from Argentina, which is not the normal situation as that country's surplus will usually find a better market in Europe." Concerning dairy products, the report says, "The duties on this group of products are of slight importance to agriculture." The findings on agriculture are expressed in the form of a table, as shown on next page.

The largest single item of net gain to the farmers, according to this table, is the wool tariff. The American farmers as a whole are paying $27,000,000 a year more for their woolen clothing and woolen fabrics on account of the tariff, but the wool growers are receiving a price increase of $37,500,000 by reason of the 31-cent tariff on raw wool, clean basis.

### EFFECTS OF PROTECTIVE TARIFF

The method used in this study by the Farm Bureau has little if any scientific value. The findings are, frankly, pure guesses. They are, however, significant for another reason. They show an organization, at that time numbering almost two million farmers, coming out with a ringing attack on the present protective system.

Does a protective tariff raise prices? If so, how much? Every manufacturer seeking a protective tariff, or what is more likely, an increase in existing duties, will claim that the effect of the

ESTIMATED RESULTS OF TARIFF ON FARM PRODUCTS

(Research Department of American Farm Bureau Federation)

| | Cost to All Consumers | Cost to Farmers | Gain to Farmers | Cost−, or Gain+, to Farmers |
|---|---|---|---|---|
| Wheat | $12,000,000 | $3,000,000 | $10,000,000 | + $7,000,000 |
| Other cereals | 1,500,000 | 500,000 | 1,000,000 | + 500,000 |
| Sugar | 192,400,000 | 48,100,000 | 45,800,000 | − 2,300,000 |
| Dairy and poultry products | 9,000,000 | ..... | 3,000,000 | + 3,000,000 |
| Wool | 91,000,000 | 27,500,000 | 37,500,000 | + 10,200,000 |
| Cattle | 1,800,000 | 1,000,000 | 1,500,000 | + 500,000 |
| Tobacco | 53,000,000 | 5,300,000 | 10,000,000 | + 4,700,000 |
| Flaxseed and linseed oil | 9,000,000 | 2,700,000 | 3,500,000 | + 800,000 |
| Miscellaneous: | | | | |
| Lemons | | | 5,000,000 | |
| Almonds | | | | |
| | 17,000,000 | 2,000,000 | 500,000 | + 6,500,000 |
| Walnuts | | | 1,500,000 | |
| Fruits and vegetables | | | 1,000,000 | |
| Hemp | | | 500,000 | |
| Cloverseed | 5,000,000 | 5,000,000 | 4,000,000 | − 1,000,000 |
| Total farm products | $391,700,000 | $94,900,000 | $124,800,000 | +$29,900,000 |

tariff, if it has any effect, is to raise domestic prices. If it did not raise prices it would not protect. The question then becomes: how much does a tariff on imports raise prices on similar goods produced at home? As before intimated, this question is impossible of a definite and specific answer. Two illustrations of this fact must suffice. Two agricultural products will be used, one in which we have a surplus and one in which we always have a shortage, namely, wheat and wool.

The tariff is 42 cents a bushel on wheat. Does the tariff raise the price of wheat in the United States 42 cents a bushel or any other amount? The tariff on wool is 31 cents a pound, basis of clean wool. Does this tariff raise the price of American wool 31 cents a pound?

So far as statistical evidence goes, the conclusion is that the tariff on wheat does not raise the price 42 cents a bushel, and the tariff on wool does not raise the price 31 cents a pound. The statistical evidence would indicate that there are times when neither of these tariffs has any effect whatever on price; there are other times when these tariffs do affect prices somewhat. But there are certain serious inaccuracies in the statistics which will need to be explained, as I shall show later.

Let us examine some typical statistical evidence, to see how difficult it is to measure tariff influences on two simple agricultural commodities. Wheat is said to be a surplus crop, because we annually export about 20 per cent of our crop. But some kinds of wheat are not surpluses but shortages. Usually the hard spring wheats of high gluten content are not plentiful enough to supply our mills and so these mills turn to Canada where there is almost sure to be a surplus of these best-quality wheats. Sometimes, however, there is a shortage in our soft winter wheats, in which case they will be imported from eastern

Canada, as in the year 1927. Again, we may have a surplus of hard spring wheats of high grades and Canada may have a shortage, in which case we export spring wheats to Canada. Bearing these fundamental facts of the market in mind, we are now ready to compare wheat prices in two similar markets, the Canadian city of Winnipeg and the American city of Minneapolis. Generally speaking, we might expect the Winnipeg price to rule about 42 cents below the Minneapolis price, since Minneapolis mills normally import some Canadian wheat to blend with domestic wheats for domestic consumption. In such cases the full amount of the duty must be paid. But the price statistics for wheat in the two cities show that other and more basic price factors completely overshadow the tariff.

### WHEAT: MINNEAPOLIS AND WINNIPEG PRICES

In early October, 1925, the cash closing price of No. 1 dark northern spring wheat in Minneapolis was 168.1 cents; in Winnipeg it was 124, the spread in favor of Minneapolis being 44.1 cents. Here the wheat growers were evidently getting the full benefit of the tariff.

In the year 1927 the situation was reversed.

In June, 1927, the cash closing price was: Minneapolis 152, Winnipeg 161; in July, 1927, it was: Minneapolis 150, Winnipeg 162; in August, 1927, it was: Minneapolis 149, Winnipeg 160. The spread during these three months was from 9 to 12 cents in favor of Winnipeg. Obviously our wheat growers got no benefit from the wheat tariff during this period. In fact, farmers near the international boundary line made money by shipping their wheat into Canada.

In April, 1928, still another situation developed in wheat. An almost unheard-of thing happened—farmers producing soft winter wheat received a premium of over 42 cents a bushel over the Toronto price of soft wheat grown in Ontario. The shortage of this wheat in the United States boosted its price above durum wheat, hard winters and hard springs. Our flour millers could not secure enough soft winter wheat to meet the demand of the big cracker companies. This wheat is not used in the United States in making bread, but only for biscuits, crackers, cakes, and pastries. Millers in the eastern United States imported part of their supply of this wheat from Ontario, and paid the full duty on it. It is extremely likely that had there been no tariff on wheat and had the entire available Canadian surplus of soft winter wheat been shipped into the United States, this importation would have had no effect on price.

Indeed, a strong case can be made out for free trade in wheat on the grounds that it would raise prices in the United States. Take one illustration. The State of North Dakota, after a few years of domination by an agrarian movement called the Nonpartisan League, found itself burdened with a white elephant in the form of a state-owned and state-operated flour mill. The mill was built, so it was announced, to grind the virgin hard spring wheats of the Dakota prairie into a fancy grade of white flour. The mill was equipped with the best and most modern machinery. After a few years of operation this unforeseen fact was discovered: North Dakota wheats are very uneven in quality, and the gluten tends to grow less in quantity and poorer in quality. To keep the flour up to a uniform and high standard, some blending with stronger wheats was necessary. The mill in buying wheats had to let the wheat price reflect flour price; the more the flour was worth the more could be paid for wheat, and *vice versa*.

It became necessary at different times to import some Canadian wheats, in order to make good flour and in order to continue to pay good prices for the Dakota wheats. Here is a clear case where it is obvious that the mill's importation of some Canadian wheat actually raised the prices for domestic wheat, because it raised the price of flour.

To carry this wheat discussion one or two steps further. In the spring of 1928 we had a surplus of "ordinary" hard spring wheat and of "ordinary" hard winter wheat, but a scarcity of soft winter wheat, and a scarcity of both spring and hard winters of over 12 per cent protein content. In other words, it is this scarcity or surplus of high-quality wheats, rather than the tariff, which accounts for the price spreads.

There is one final difficulty in comparing wheat prices in two or more countries. No. 1 northern spring wheat in Winnipeg is not the same commodity as No. 1 northern spring wheat in Minneapolis, the Canadian grading system being on an entirely different basis. Therefore, we are really comparing prices of two different and non-comparable commodities. I know of no way of obviating this fundamental difficulty. Therefore, all statistical comparisons of wheat prices at home and abroad are inaccurate and must be taken very much below their face value. The same holds true for wool or for any other product. Let us turn now to an examination of the wool question.

## EFFECTS OF TARIFF ON WOOL PRICES

To determine the effect of the tariff on wool prices it is customary to compare wool prices in Boston and London,

PRICES OF FINE TERRITORY COMBING WOOLS AT BOSTON AND 64–70's AT LONDON

| | Boston | London | Excess of Boston over London |
|---|---|---|---|
| 1922: | | | |
| Jan. 12 | $0.975 | $0.820 | $0.155 |
| Feb. 2 | 1.10 | .842 | .258 |
| June 9 | 1.325 | .937 | .388 |
| 1923: | | | |
| Jan. 26 | 1.435 | 1.124 | .311 |
| Mar. 9 | 1.455 | 1.059 | .396 |
| Nov. 14 | 1.29 | 1.126 | .164 |
| 1924: | | | |
| Jan. 25 | 1.375 | 1.179 | .196 |
| July 11 | 1.275 | 1.234 | .041 |
| 1925: | | | |
| Mar. 13 | 1.60 | 1.197 | .403 |
| May 14 | 1.24 | 1.153 | .087 |
| 1926: | | | |
| Jan. 22 | 1.275 | .973 | .302 |
| June 10 | 1.10 | .973 | .127 |
| 1927: | | | |
| Average spread for whole year, .144 | | | |

and to assume that the Boston grade, Fine Territory Combing Wool, is the same as the English grade, 64–70's. If the tariff works automatically, then the spread between London and Boston would be approximately 31 cents. But such a spread very rarely occurs. On the contrary, the spread varies from a cent or two, up to over 40 cents. The table on the preceeding page presents a true picture.

A careful reading of the table will convince any open-minded person that at times the tariff has little effect on wool prices. The dominant price factors most of the time, perhaps all the time, are the fluctuating demands of consumers of finished products, the quantity and quality of available wools on the world's markets.

One difficulty must be mentioned which does not appear in these statistics. Statistics may tell the truth, but they probably never tell the whole truth. In this price comparison, we are comparing our domestic wools with Australian wools. The Australian fleece is skirted (trimmed of ragged locks and undesirable parts), while the American fleece is not; the Australian fleece is tied with paper twine, while the American fleece is probably tied with harmful twines. There are several other points in favor of the quality of the Australian wools, although the grades themselves may seem comparable. The price spread, may, in fact, reflect both the discounts for our poor quality and the premiums for our tariff. This matter cannot be determined from the published data.

### TARIFF MEASURING DIFFICULTIES

The discussion thus far has been negative rather than positive, to show the difficulties in measuring tariff blessings and handicaps. I am inclined to think that the effects of the tariff are greatly overestimated, whether on agricultural or industrial products. The California farmers want more tariff on rice, yet they ship most of their rice to Japan and sell it there at a profit in competition with Japanese rice. We now know that the highest paid labor in the world makes the cheapest automobile in the world and sells it in all countries of the world in the face of all the competition in the world. We know that New England cotton mills and woolen mills, after one hundred and twelve years of high protection, are in a state of depression. Hence Massachusetts, in the 1928 election, voted against the high tariff party. We know that American banks, chain stores, and railroads, with no protection, are very prosperous. Hence the tariff as a factor in national economic progress is likely of little or no importance. The sheep and wool industry, we know, has waxed and waned at different periods for reasons wholly apart from the tariff. Yet the fact remains, as the farmers are beginning to feel, that protection from 1789 to 1922, was designed to help manufacturers. This was foreshadowed in the title of the first tariff act ever passed in the United States, that of July 4, 1789, which stated frankly that it was for "the encouragement and protection of manufacturers."

Assuming, as was stated above, that the tariff does raise prices sometimes and to a certain extent, we may next turn our attention to the present tariff law (Act of 1922) and ask: what are the handicaps to the farmers in this law?

### THE 1922 TARIFF ACT

Partisans of this tariff claim that farm machinery is on the free list, and hence the farmer has no tariff burden on one of his chief items of expenditure. It is true that the free list does include farm machinery, but since the awkward farm implements made abroad would

not be used by our farmers anyway, this favor to the farmer is shadow rather than substance. The free list also includes Bibles, binder twine, bones, books over twenty years old, brick, cement, coal, coffee, cowhide gloves, hides, leather, boots and shoes, needles, sheep dip, shingles, turpentine, barbed wire, logs.

Many articles on this free list are non-competitive, since the domestic product holds the domestic market, and is also exported. This is true of shoes, for instance. Barbed wire is also strictly a domestic product.

If we turn to the dutiable list we find that almost every article bought by the farmer either directly or indirectly pays a duty. Thus farm implements are on the free list, but iron and steel are protected. Logs are on the free list but lumber is protected. The following schedules contain articles used in agriculture—partly in the farmer's home, partly in his technical operations, and partly by manufacturers who produce for the farmer:

1. Chemicals, oils, and paints. This list includes a vast number of things consumed on the farm, ranging from paris green and paint, to castor oil and soap.

2. Earths, earthenware, and glassware. Here we find most of the equipment of the farmer's kitchen and dining room on the dutiable list—dishes, electric light bulbs, watch crystals, spectacles, field glasses. Grindstones and tombstones are included.

3. Metals and manufactures of. On most forms of raw steel the duty ranges from 20 cents to $3.50 per hundred pounds. The dutiable list covers hundreds of items, including horseshoes, kitchen utensils, aluminum utensils (11 cents per pound and 55 per cent *ad valorem*), saws, hammers, axes, pliers, watches (seventeen jewels, $10.75), alarm clocks, shovels, spades, scythes, knives, etc.

4. Wood and manufactures of. The furniture of the house is all dutiable; so, also, toothpicks, baskets, curtains, screens, clothespins, etc.

5. Sugar, molasses, and manufactures of. Cane sugar, usual strength, pays a tariff of 1.76 cents per pound. The average farm family consumes 500 pounds per year, and therefore pays a duty of $8.80 on this commodity.

6. Tobacco and manufactures of. Cigars, cigarettes, cheroots, chewing tobacco, snuff, etc., are all dutiable.

7. Agricultural products and provisions. This subject has already been considered.

8. Spirits, wines, and other beverages.

9. Cotton manufactures. Cotton yarn and cotton fabrics are dutiable at varying rates. A cotton tablecloth, for instance, is taxed 30 per cent of its value; quilts 40 per cent; cotton cloths of various kinds from 33 to 40 per cent; cotton gloves 50 per cent; stockings 50 per cent.

10. Flax, hemp and jute and manufactures of.

11. Wool and manufactures of. Rugs, blankets, woolens, worsteds, and so on, are all taxed at rates ranging in amount from 20 per cent to 100 per cent of their value. This is one of the most effective of the schedules, as the British, German, and French manufacturers could and would furnish us better blankets, rugs, cloths, etc., at lower prices than we pay for the domestic product. The farmer's handicap here is a substantial one.

12. Silk and silk goods.

13. Paper and books.

14. Sundries. Here we find brooms, buttons, dolls, watches, feathers, dress furs, hats, caps, jewelry, laces, belts, satchels, cardcases, pocketbooks, harness, saddles, door locks, musical instruments, cameras, umbrellas, parasols, phonographs, electrical insulators,

lead pencils, moving picture films. The dutiable list covers items for the whole family, from the cradle to the grave, including the cradle, the castor oil and the rattle for the baby, the dolls and the marbles for the girls and boys, and not even omitting the coffin and the tombstone for grandfather.

Most of the commodities used by the farmer and the farmer's wife are unquestionably on the dutiable list. Does the tariff raise the price of these commodities? On some of them, yes; on many of them, no. On sugar and on woolens the price is undoubtedly raised by the tariff. How much does the tariff raise these prices? Nothing but a guess could be given in answer to this question. The conclusion seems warranted that when the tariff gains and losses are balanced for the farmer the balance shows a net loss to the farmer. The American Farm Bureau Federation states the amount as $800,000,000, or about $10 per family. My estimate would be five times this amount or $50 per farm family.

### LARGER ASPECTS OF PROBLEM

In conclusion, some larger aspects of tariff handicaps for agriculture may be cited. Our farmers have, and will continue to have, an annual food surplus of 15,000,000 tons to be sold abroad; also a surplus for foreign markets of 2,000,000 tons of cotton and 320,000 tons of tobacco. These commodities are in part exchanged for imported, noncompeting agricultural products, such as silk, rubber, coffee, tea. In spite of tariff walls, our goods are more and more subject to foreign competition; that is, competition in foreign markets whence our surplus goes. Our Department of Agriculture estimates that 90 per cent of our agricultural products have their prices directly affected by foreign demand and foreign competition. With only one-fourth of our land in cultivation, we can easily increase our exportable surpluses. We will, therefore, need more, not less commerce. Our dilemma promises to be this: How long can a Surplus-Creditor-High Tariff Country continue to carry on foreign trade? This seems to be one of the unsolved riddles in economics. The point cannot be discussed here.

Since farmers need more commerce, the farmer's best interests require a movement in the direction of lower tariffs and freer trade. The farmer must see, for instance, that foreign trade is now three-cornered. If a tariff shuts Argentina corn out of New York, this same corn will compete equally much in Liverpool whither it will be driven by the tariff wall. The world is fast coming to be an economic unit where a balanced world production will be the overshadowing problem, and the free flow of these goods to markets the secondary problem. The farmers should favor the free flow of goods in international commerce as the first step towards a balanced world production. The doctrine of comparative costs in economics is a principle which holds true, however much it may be temporarily violated by erring lawmakers. The narrow, immediate-expediency view of the tariff, held by the farmer, is now becoming his greatest handicap. Thus, when a few farmers growing onions in the United States had a tariff barrier thrown up to exclude the onions from the little island of Bermuda, the Bermuda farmers were forced to trade their onions for Canadian wheat rather than American wheat. In this way one set of our farmers took toll from another set of our farmers. Each one, in looking out for himself, is willing to prey on his neighbor. A national policy of agricultural production, as opposed to this anarchistic system, is needed. The tariff is now one of the greatest obstacles to an economically sane and balanced agriculture.

# Changes in Production and Consumption of our Farm Products and the Trend in Population*

## Do We Need More Farm Land?

By O. E. Baker

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SINCE the World War three new facts of the greatest importance have become evident in American life which must be given consideration in any proposals for agricultural expansion. The first fact, that of recent extraordinary increase in agricultural production, relates to the present and near future. The second fact, that of notable changes in consumption of foods and fibres, also relates both to the present and the near future. The third fact, that of decreasing birth rates and probable attainment of a stationary population in about fifty years, perhaps sooner, relates solely to the future, but bears directly on present policy with reference to agricultural expansion. These facts suggest that not only is there no need for more agricultural land at present, considering the nation as a whole, but also that it is unlikely there will be as rapid increase of crop land in the next half century as that which occurred in the half century preceding the World War. The needs of the less rapidly increasing population will be met mostly by other means. Let us consider briefly the evidence supporting these conclusions.

### THE INCREASE IN AGRICULTURAL PRODUCTION

During the past two years the Division of Land Economics in the United States Bureau of Agricultural Economics has been working on an index of agricultural production and consumption since the beginning of the twentieth century. The various crops and animal products (bushels, bales, pounds, etc.) are totaled on the basis of average farm price during the decade 1917–26. This normal farm value of the crops through a series of years represents more closely than any other common denominator the aggregate amount of labor, capital, and other factors involved in production; in fact, it is the only common denominator that permits combining foodstuffs with fibres.[1] The work is not yet completed but is sufficiently complete to show that at no time since 1900, and probably since 1890, has agricultural production increased at so rapid a rate as in the years since the World War. This is very remarkable in view of the decrease between 1919 and 1924 in farm land, in crop land, in number of farm animals (animal units), in number of farms and in farm population, as shown by the census. Never before have census statistics shown a contraction in the agricultural area of the nation, nor in the number of farms and farm population. The decrease in farm animals and farm population has continued since 1925, according to the annual estimates of the United States Department of Agriculture; but there was an appreciable increase in crop area harvested in 1926 and again in 1928.

* Addresses before the Agricultural Extension Conference, University of Minnesota, St. Paul, Minn., December 13 and 14, 1928.

[1] Later the foodstuffs will be totaled on the basis of energy value, measured in calories, in order that data may be available on changes in diet measured in this manner.

Even more remarkable is the fact that this increase in production since the war occurred despite an unprecedented decline in the level of prices of many farm products. Up to and including the war years the general trend of prices of agricultural products was upward, as compared with prices of commodities farmers buy. On the other hand, this average purchasing-power price of farm products in the United States declined 24 per cent between 1920 and 1921, and since 1922 has remained about stationary at 85 to 90 per cent of the pre-war (1909–14) purchasing-power price.

Apparently, the introduction of the automobile, the truck, and the tractor, with associated machinery, which has caused a large decrease in horses and a smaller decrease in mules and released a large amount of feed for meat and milk animals; together with the influences exerted by the various agencies for the promotion of agriculture—the agricultural press, the farm organizations, the agricultural colleges, extension services and experiment stations, the State Department of Agriculture, the United States Department of Agriculture and other organizations; and, finally, the pressure exerted by higher wages, and probably also by higher taxes, have led to the adoption of improved agricultural practices more rapidly than in any previous period of our history. In particular, there has been a strong tendency to sell the poorer livestock and secure a larger product from smaller or stationary numbers.[2]

Comparing the five-year period 1917–21 with the period 1922–26 (these two periods being centered on the census years, 1919 and 1924, which are five years apart), the production of animal products (mostly meat and milk) increased nearly 16 per cent, although there was no appreciable increase in the amount of feed available for farm animals other than that released by the decrease in horses and mules; the aggregate production of crops for industrial uses (mostly cotton, flaxseed and tobacco) increased in the aggregate nearly 17 per cent (but was little larger than in the period 1912–16); while the production of foodstuffs from plants (mostly wheat flour, potatoes, vegetables and fruits) increased over 7 per cent. Agricultural production as a whole increased about 13.5 per cent, whereas population increased about 8 per cent; in other words, the increase of agricultural production was fully 50 per cent greater than of population. Incomplete data for the years 1927 and 1928 indicate that agricultural production is still increasing more rapidly than population.

### THE MEANS OF INCREASING AGRICULTURAL PRODUCTION

The principal means by which agricultural production in the United States has been increased in the past has been by expansion of the crop area. Westward the Star of Empire took its way. The expansion of agriculture across the Atlantic Slope, then over the Appalachian Mountains into the eastern Mississippi Valley, followed by the settlement of California and Oregon, and an eastward movement of settle-

[2] This rapid technical progress in agriculture has been attributed to the World War, just as the rapid progress after the Civil War was attributed to the same cause. But the fact that the tractor and automobile were rapidly coming into use prior to the World War, just as haying and harvesting machinery were coming into use prior to the Civil War, indicates that the conditions arising from the war were not the cause of the progress. However, the reduction in available labor and the rise in prices of agricultural products during war time, as well as patriotic impulse and greater openness of mind, undoubtedly hastened the adoption of improved farm practices and methods.

ment from the Pacific Coast into the Rocky Mountain Region, led largely by miners; and, finally, the occupation of the semi-arid Great Plains Region and the Upper Lakes Area during the past quarter century or more, has caused most people to assume that the needs of the increasing population can be met only by expansion of the crop area. A few people realize the possibilities of increasing production by securing higher yields per acre of the crops and pastures. These two means, the horizontal expansion of crop area and the perpendicular, so to speak, increase in acre yields, are commonly assumed to be the only methods of increasing agricultural production.

But since the World War expansion of the crop area has ceased, the census of 1924 showing a decrease of 13 million acres as compared with 1919. However, the acreage in 1924 was the lowest since the war, the annual estimates of the United States Department of Agriculture showing a rising acreage since 1924, with an area in crops in 1928 almost as large as in 1919. Likewise, acre-yields of the crops have increased, in the aggregate, very slightly, if at all, since the World War. The acre-yields of the feed crops (fed to farm animals) decreased slightly, but the larger acre-yields of the food crops (consumed by man) accounts for about one-tenth of the increase in agricultural production, and is the smallest in influence of all the factors. Clearly other methods of increasing agricultural production are now in operation.

These other means of increasing agricultural production which suddenly have become of great importance, are principally four:

1. The rapid increase in automobiles and tractors, which has resulted in a decrease in horses and mules, and released, as a consequence, a large amount of feed for meat and milk animals. This has been, apparently, one of the major factors in accounting for the increase in agricultural production. Fully two-thirds of the increase in agricultural production consists of animal products (mostly meat, milk and eggs), and possibly two-fifths of this increase in animal products is attributable directly to the tractor and automobile, that is, this factor accounts directly for about a fourth of the total increase in agricultural production. Indirectly, by inducing geographic shifts in production, it accounts for, probably, a tenth more.

2. An equally important factor is the increasing production of meat and milk per unit of feed consumed by each class of livestock, except, possibly, in the production of beef. This factor also accounts for about two-fifths of the increase in production of animal products, and is in part owing to the geographic shifts promoted primarily by the tractor and automobile.

3. Closely associated with this factor is a shift from the less efficient classes of farm animals in the transformation of feed into food toward the more efficient, principally from beef cattle and sheep toward dairy cattle and hogs. It requires much less feed to produce equivalent values of milk and pork than of beef and mutton.

4. Similarly, there has been a shift since the World War from the less productive crops per acre toward the more productive, notably from wheat toward corn in the Great Plains Region, from corn toward cotton in the Cotton Belt, and from the cereals and hay crops toward fruits and vegetables in parts of California and Florida, and in other fruit and vegetable producing areas.

Let us consider these four factors briefly, and also the fifth, that of increase in acre yields of the crops.

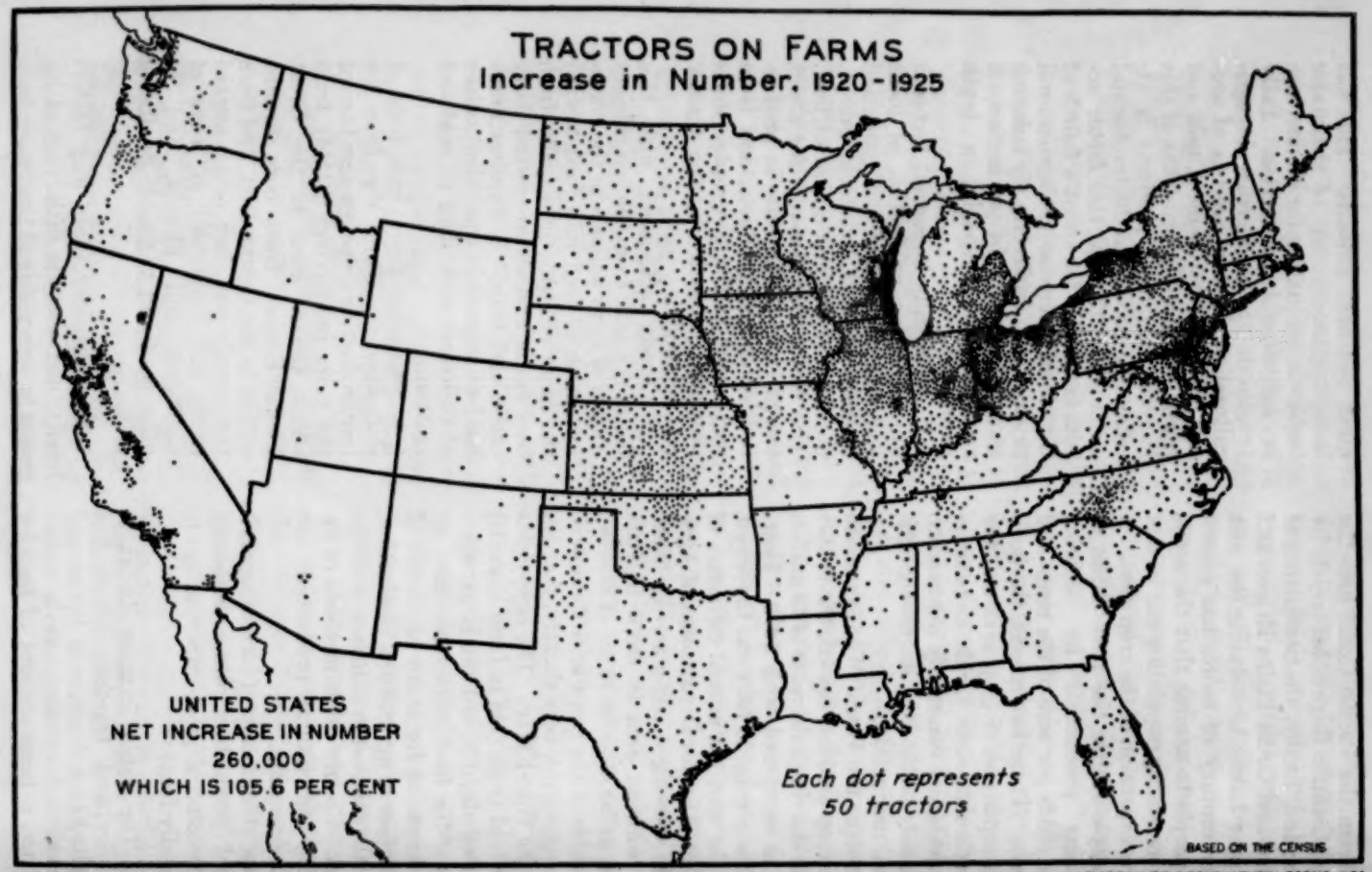


FIG. 1.—The increase in number of tractors between 1920 and 1925 occurred mostly in the rich Corn Belt and in the more fertile portions of the Hay and Dairying Belt, in the Hard Winter Wheat Region, and in California. The increase was especially notable near the large industrial centers, where wages are high, and less notable on the large farms of the Central West, where, however, larger tractors are used than in the East. Very few tractors are used in the South, except in the Piedmont of North Carolina and in Central and Northwestern Texas.

### THE COMING OF THE TRACTOR AND AUTOMOBILE AND SOME OF THE AGRICULTURAL CONSEQUENCES

One of the peculiar characteristics of the present agricultural situation is the many-fold influence of the tractor and automobile (Fig. 1).

Between January 1, 1920, and January 1, 1925, the decline in horses and mules, consequent upon the coming of the tractor and automobile, released between 5 and 10 million acres of crop land for other uses or non-use; and between 1918, when the decline began, and today, 1928, the crop land thus released is probably about 15 million acres. Since all horses and mules required about 80 million acres of crop land for their sustenance in 1919,[3] it appears that nearly one-fifth of this total amount has already been released. Nearly all of these 15 million acres of crop land are now used to feed meat and milk animals or to grow cotton. The portion used to feed meat and milk animals constitutes an addition of 5 or 6 per cent to the land so used in 1919. As population increased about 16 per cent during this past decade, it appears that this percentage increase in crop acreage available to produce feed for meat and milk animals is about a third as great as the percentage increase in population.

In reality, the increase in feed for meat and milk animals was greater than these percentage figures of acreage indicate, for the decrease in horses occurred principally in the Corn Belt and the Hay and Dairying Belt, which are our more fertile regions, where the acre-yields of the crops are the highest and where the production of meat and milk per unit of food consumed is the greatest (Figures 2, 3 and 4). In the Cotton Belt, on the other hand, where the acre-yield of corn is half that in the Corn Belt, and where, in general, animals are much less efficient in transforming feed into meat and milk, the quantity of crop feed grown which was available for meat and milk animals had fallen in the period 1922–26 to half that in the period 1917–21, the number of hogs had declined 32 per cent, and of cattle 14 per cent (Figs. 5, 6 and 8). By 1928 the decline in hogs had become nearly 40 per cent and of cattle over 20 per cent (Figs. 10 and 11). Simultaneously, the production of corn and hogs increased in the Western Corn Belt and Spring Wheat Region (Figs. 7 and 9). On the other hand, the acreage of cotton increased notably in the Cotton Belt, but not sufficiently to prevent several million acres of land, mostly in the eastern portion of the Belt, going out of use (Figs. 12, 13, 14 and 15).

Thus the tractor and automobile, by reducing the number of horses and mules in the North and West and releasing feed for other farm animals, has promoted geographic shifts in crop and livestock production, which have resulted for the nation as a whole in increased production per acre and increased production per animal as well as increased production per man.

Moreover, the increasing use of the tractor may cause not only a continuation of this shift in livestock production,[4] but also further expansion of agriculture into the semi-arid grazing area of the Great Plains; and, furthermore, will probably stimulate the production of crops at the expense of

[3] See "The Utilization of Our Land for Crops, Pasture and Forests," United States Department of Agriculture, *Yearbook*, 1923, p. 456. Later data on feed consumption of horses and mules, calculated by States, reduces the former estimate of 90 million acres to slightly under 80 million acres.

[4] However, the trend in number of hogs has been upward in the South and East since 1926, as well as in the Corn Belt, and the number of cattle is also now increasing.

Dairying Belt, in the Hard Winter Wheat Region, and in California. The increase was especially notable near the large industrial centers, where wages are high, and less notable on the large farms of the Central West, where, however, larger tractors are used than in the East. Very few tractors are used in the South, except in the Piedmont of North Carolina and in Central and Northwestern Texas.

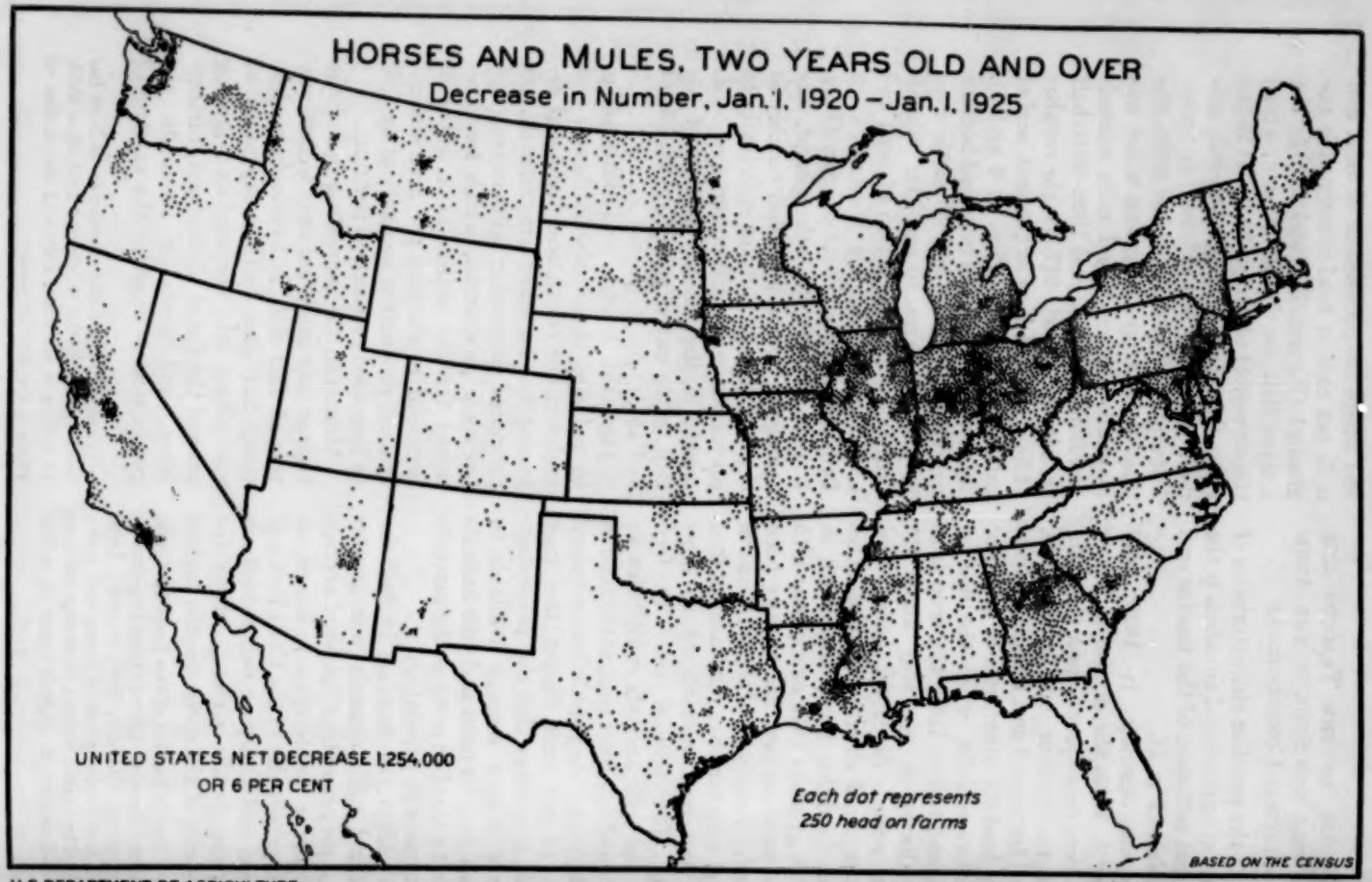
HORSES AND MULES, TWO YEARS OLD AND OVER
Decrease in Number, Jan. 1, 1920 – Jan. 1, 1925
UNITED STATES NET DECREASE 1,254,000
OR 6 PER CENT
Each dot represents
250 head on farms
BASED ON THE CENSUS
U.S DEPARTMENT OF AGRICULTURE
BUREAU OF AGRICULTURAL ECONOMICS

FIG. 2.—The greatest decrease in number of work horses and mules between 1920 and 1925 took place in the eastern and central Corn Belt, in the Hay and Dairying Belt, and in California—in brief, where the increase in tractors was greatest. But a notable decrease occurred also in Georgia and South Carolina, and in other Southern States, which was associated with the decrease in total crop land harvested (Fig. 15), and can be attributed only partly and indirectly to the tractor and automobile.

pasture in many established farming areas (Fig. 16). In other words, continued progress in tractor cultivation seems likely to cause a still further concentration of milk and meat production on the more fertile or more level lands of the North and West, and afford little, if any, help to the farmers in hilly or sandy areas or on submarginal lands in general; indeed, is likely to make their situation even more difficult, except those along the semi-arid margin of the Great Plains Region.

### THE INCREASE IN ANIMAL PRODUCTS PER UNIT OF FEED CONSUMED

The increase in production of meat and milk per unit of feed consumed, like the increase assignable to the automobile and tractor, appears to be a recent development in the United States. Probably the production of milk per unit of feed consumed, and possibly of meat also, has been increasing irregularly for a century, but in the statistical data compiled for the period since 1900 this increasing efficiency in transforming feed into human food first becomes evident, except for sheep, near the close of the World War (Figs. 17, 18 and 19). A rough estimate of the magnitude of this factor in increasing production can be reached only indirectly, through data on production per animal.

The estimates of the United States Department of Agriculture indicate about 4 per cent more dairy cows and heifers on farms in the United States January 1 in the period 1922–26 than in the period 1917–21, but that about 22 per cent more milk was produced; about 8 per cent fewer cattle but that nearly 9 per cent more beef and veal was produced. However, after allowance is made for the decline in number of cattle on farms, there is indicated only 9 per cent increase in production of beef and veal per head on farms. Apparently, the increase in dairy animals slaughtered, which are inefficient as producers of beef, partially balances the increased efficiency resulting from slaughter of beef animals at an earlier age and improvement in quality.

With hogs, however, as with dairy cows, the increase in production per head has been very large. There was about the same average number of hogs on farms January 1 in the period 1922–26 as in the period 1917–21, but the increase in pork and lard under Federal inspected slaughter (which is nearly two-thirds of the total slaughter) was 25 per cent. Undoubtedly the inspected slaughter of hogs has constituted a larger proportion of the total slaughter in recent years, so that the increase in total production of pork and lard has been somewhat less, about 20 per cent, according to the estimates of the Bureau of Animal Industry. There were somewhat more sheep on farms and ranges at the end than at the beginning of the period 1922–26, and after allowance is made for this increase of stock, the increase in production of mutton and lamb per head on farms January 1 becomes about 19 per cent.

Increase in production per animal is, of course, greater than increase in production per unit of feed consumed, but, after including the feed released by the decrease in horses and mules, it appears that the production of animal products in relation to feed consumed by the animals increased in the neighborhood of 7 per cent between these two periods five years apart. This does not include the increase caused by shifts from less efficient toward more efficient classes of animals in transforming feed into human food, *i.e.*, from beef cattle and sheep toward dairy cattle and hogs.

The increase in animal products per unit of feed consumed is owing both to improvement in the animals in the

and Dairying Belt, and in California—in brief, where the increase in tractors was greatest. But a notable decrease occurred also in Georgia and South Carolina, and in other Southern States, which was associated with the decrease in total crop land harvested (*Fig. 18*), and can be attributed only partly and indirectly to the tractor and automobile.

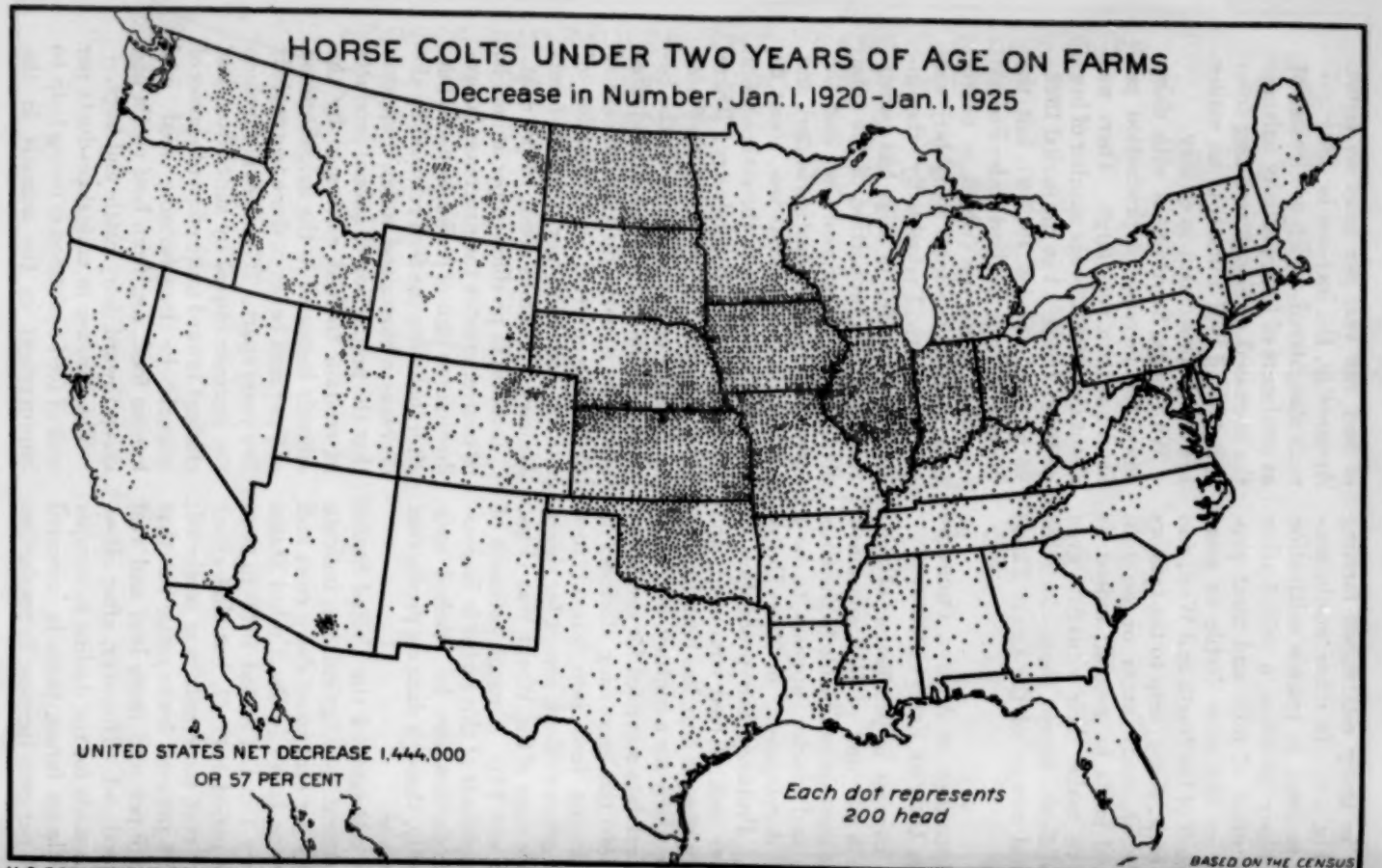
HORSE COLTS UNDER TWO YEARS OF AGE ON FARMS
Decrease in Number, Jan. 1, 1920 - Jan. 1, 1925
UNITED STATES NET DECREASE 1,444,000
OR 57 PER CENT
Each dot represents
200 head
BASED ON THE CENSUS
U. S. DEPARTMENT OF AGRICULTURE
BUREAU OF AGRICULTURAL ECONOMICS

FIG. 3.—Between 1920 and 1925 the decrease in colts in the United States was 57 per cent, whereas the decrease in mature horses and mules was only 5.7 per cent. The decrease in colts was practically universal, and was greatest in number where the greatest number of colts are raised, *i.e.*, in the Corn Belt, the Wheat Regions and the Great Plains. This rapid decrease presages a notable decline in mature animals during the decade to follow.

principal producing areas and to geographic shifts in the several enterprises. As these causes differ in relative importance for the several animal products, and also regionally for each product, it appears worth while to describe the changes in just a little detail.

### INCREASE IN PRODUCTION OF MILK PER COW AND PER UNIT OF FEED CONSUMED

In the case of dairy cattle, much of the increase appears to be assignable to improvement in productiveness of the cows. The total number of cows two years old and over in New England (practically all dairy cows) decreased nearly 7 per cent between January 1, 1920, and January 1, 1925, according to the census; but the milk production in 1924 was 4 per cent greater than in 1919. This indicates an average increase of milk production per cow in New England of about 12 per cent. The decrease in number of cows in New York was 8 per cent, but the decrease in milk production, according to the census, was only 2 per cent.[5] In Pennsylvania all cows two years old and over decreased 2 per cent, but milk production increased 6 per cent. The decrease in total cows in New Jersey was 6 per cent, but the milk produced increased 8 per cent. In Michigan cows increased 3 per cent and milk production increased 11 per cent. In Wisconsin cows increased 9 per cent, while milk production increased 23 per cent; and in Minnesota total number of cows increased 12 per cent, while milk production increased 40 per cent (Figure 20). This large increase in production of milk per cow in Minnesota is partly explained by the fact that in the southern portion of the state there were a large number of beef cows in 1920 which were partially replaced by dairy cows by 1925.[6]

For these twelve dominantly dairying states as a whole, in which 94 per cent of the cows two years old and over were dairy cows on January 1, 1920 and 93 per cent of all cows were milked in 1924, the increase in number of cows from January 1, 1920, to January 1, 1925, as shown by the census, averaged 2 per cent, whereas milk production in 1924 was 14 per cent greater than in 1919, indicating an average increase of milk production per cow of about 12 per cent.

The increase in production of milk between 1919 and 1924, according to the census, was as notable in parts of the Corn Belt as in the Hay and Dairying Region. In the Corn Belt beef cattle are numerous, hence it is necessary to consider changes in number of "cows and heifers kept for milk," as estimated by the United States Department of Agriculture, rather than total number of cows as given in the census returns. In Illinois the production of milk increased 17 per cent, whereas the number of cows and heifers kept for milk remained stationary. In Iowa the production of milk increased 43 per cent between 1919 and 1924, but cows and heifers kept for milk increased only 19 per cent. Here, as in Minnesota, there was a trend from beef toward dairy cattle. In Missouri the increase in milk production was 20 per cent, whereas cows and heifers kept for milk increased 4 per cent. For the seven Corn Belt States as a whole, milk production increased 20 per cent, ac-

[5] New York, New Hampshire, and Maine are the only Northern states for which a decrease in milk production is indicated, and this indicated decrease may be owing to less complete census enumeration in 1925, when no population census was taken simultaneously. This would not affect production per cow, however.

[6] These census figures on milk production must be considered approximate only. For example, it is almost certain that more milk was produced in New York in 1924 than in 1919 The figures are used primarily to show the wide spread increase in production of milk per cow.

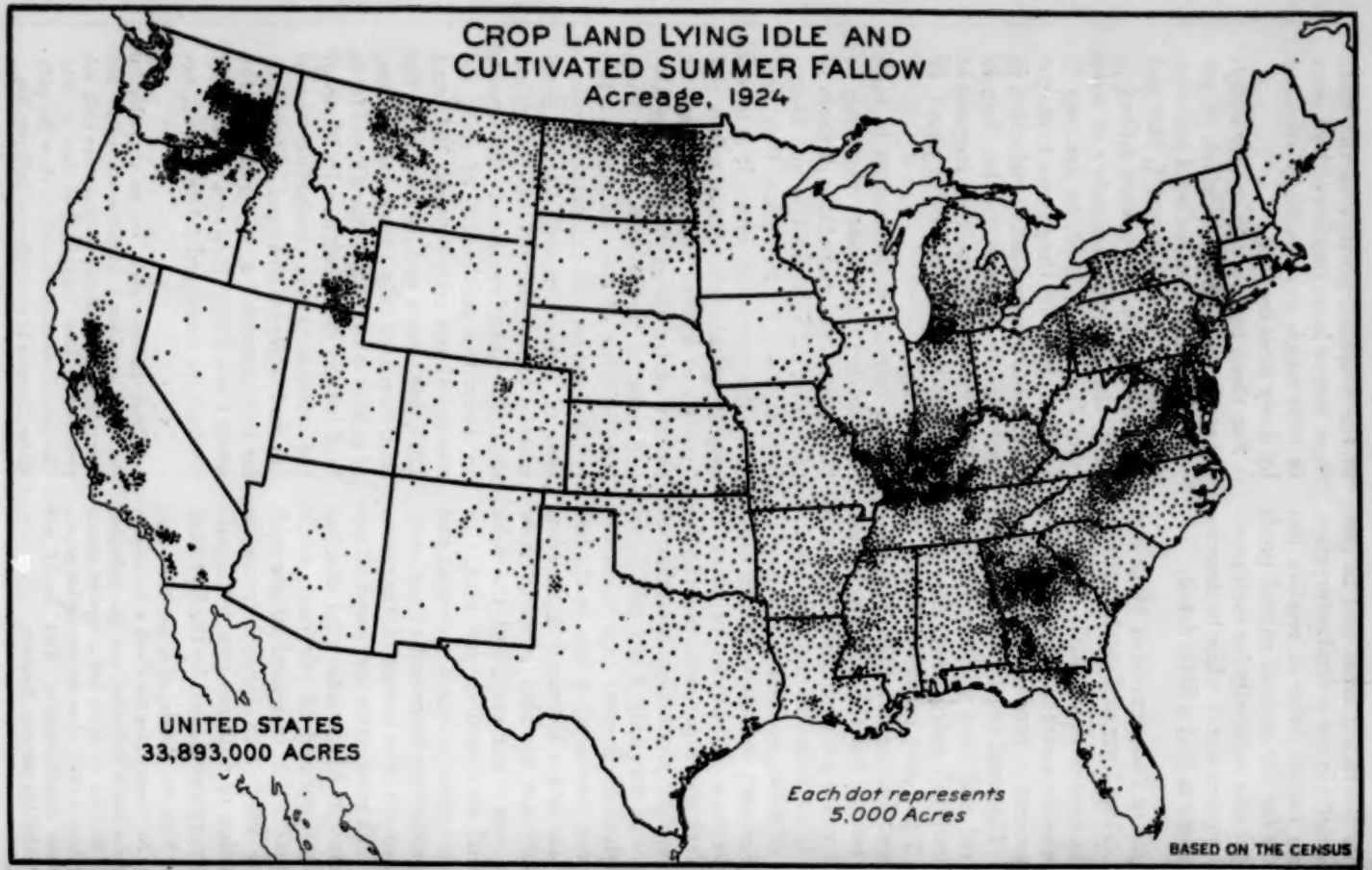


FIG. 4.—The greatest extent of crop (plow) land lying fallow in 1924 was in the Piedmont Belt, extending from New York City to Alabama. Another notable area included western Kentucky and southern Indiana and Illinois. The soils in both these areas are of medium or lower fertility. The large acreage in North Dakota and Montana is partly summer fallow, and the dense area in eastern Washington is mostly summer fallow. However, in these areas, and also in California, a large amount of dry-farming land lay idle.

cording to the census, whereas the number of cows and heifers kept for milk increased 8 per cent, according to the estimates of the United States Department of Agriculture. This indicates an increase in production per cow of about 11 per cent in the five years—nearly the same proportionate increase as the average for the Hay and Dairying Region. However, in the northern Corn Belt especially, in addition to improvement in dairy cattle, there has been a considerable shift from cattle kept primarily for beef, for which the milk production per cow is small, toward more dual-purpose and dairy animals.

That the large increases in milk production between 1919 and 1924 reported by the census for the States west and southwest of Lake Michigan are not excessive is indicated by the returns from butter factories made annually to the United States Department of Agriculture and biennially to the Bureau of the Census. According to the statistics of the United States Department of Agriculture the increase in production of creamery butter between 1919 and 1924 was 80 per cent in Wisconsin, 76 per cent in Minnesota, 81 per cent in Iowa, 94 per cent in North Dakota, 41 per cent in South Dakota and 35 per cent in Nebraska. For the six states the average is over 70 per cent. However, after estimates of butter made on farms are added, the increase in total butter production becomes 71 per cent for Wisconsin, 63 per cent for Minnesota, 61 per cent for Iowa and 56 per cent for the six states. The percentage increase in milk production, according to the census, was lower in each of these states than this percentage increase in butter production, in Wisconsin being only one-third as great, and in Iowa and Nebraska only a little over half as great. It appears very probable that the increase in milk production in these states between 1919 and 1924 was much greater than that indicated by the census.

In many other portions of the United States the percentage increase in milk production between 1919 and 1924 was no less noteworthy than in the western part of the Hay and Dairying Region and in the Corn Belt. In Oklahoma the increase, according to the census, was 31 per cent, in Texas 35 per cent, and in the states from New Mexico to Montana and westward to the Pacific Coast grouped as a whole, 28 per cent. Only in the states of the Cotton Belt east of the Mississippi River, and in Ohio, West Virginia, Pennsylvania, New Jersey, New York and northern New England is the increase in milk production less than 10 per cent; and in only five states—Georgia and South Carolina, New York, New Hampshire and Maine—is a net decrease indicated by the census, and even in these states milk production per cow, apparently, increased greatly.

The increase in milk production per cow is much greater, of course, than the increase in production per unit of feed consumed. For the United States as a whole production per cow increased 12 per cent between 1919 and 1924, according to the census, and over 18 per cent between the five-year periods centered on these census years, according to the estimates of the United States Bureau of Agricultural Economics. One hundred thousand cow testing records compiled by the United States Bureau of Dairying indicate that consumption of feed increases less than half as rapidly as production of milk per cow, but when the entire herd is considered the increase in feed consumption is about 70 per cent as great as the increase in milk production per cow. Applying this latter ratio to the census figures it appears that the increase in production of milk per unit

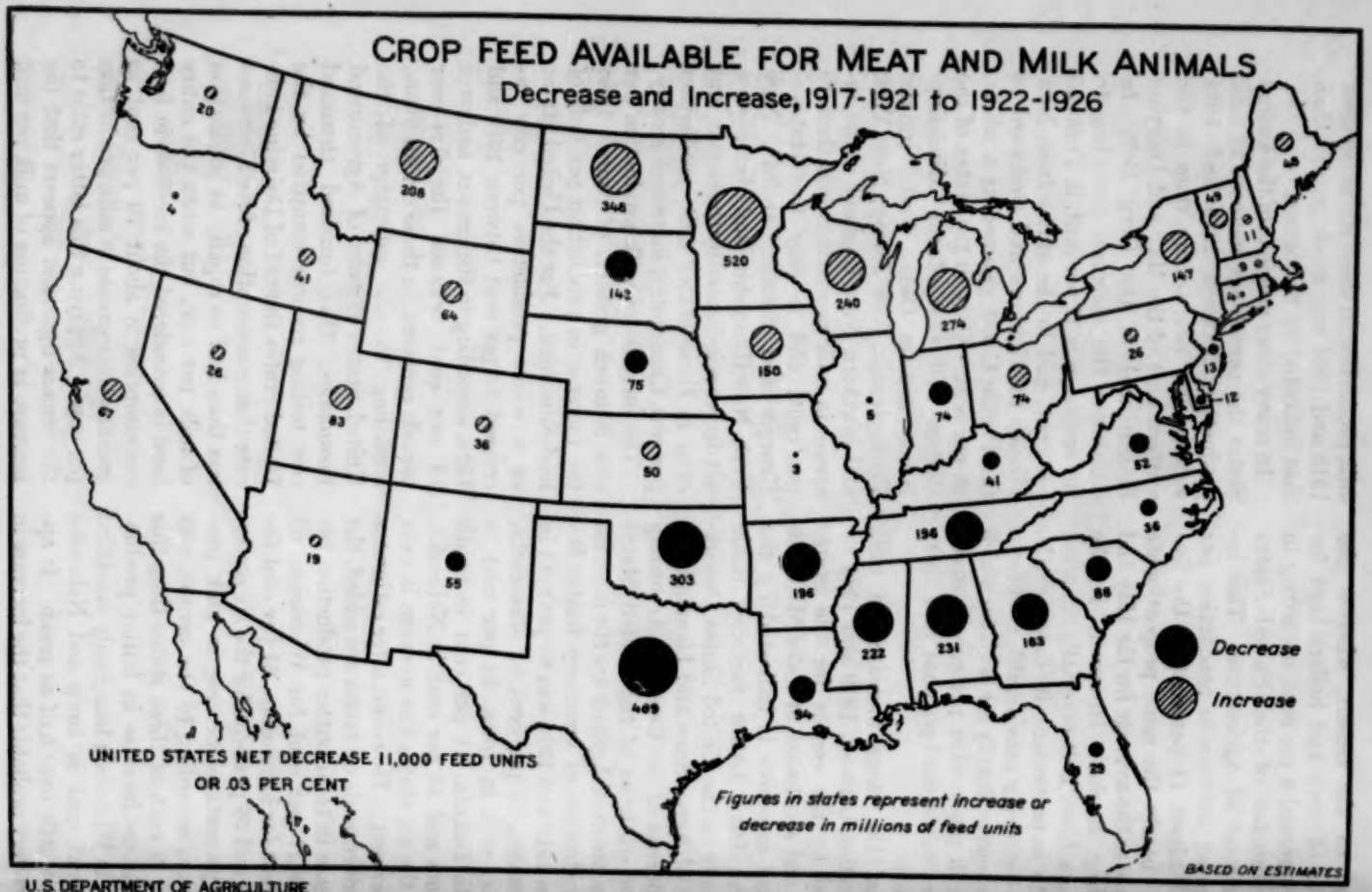


FIG. 5.—In all the Southern States the quantity of home-grown crop feed available for meat and milk animals has declined notably. On the other hand, in the Hay and Dairying Belt and in the far Western States, except New Mexico, the crop feed grown for meat and milk animals has increased. In the Corn Belt the feed increased in Ohio and Iowa and decreased in Indiana, Nebraska and South Dakota, in the last two states because of severe drought in 1924, 1925, and 1926.

of feed consumed was about 4 per cent between 1919 and 1924 for the United States as a whole, but fully 6 per cent in Minnesota.

Using the estimates of the United States Department of Agriculture for the five-year periods centered on the census year would raise the United States figure to 6 per cent. It appears probable that the five-year average estimate is the better figure to use, and that production of milk per unit of feed consumed increased about 6 per cent during the first five years after the war, or fully 1 per cent a year. The Department of Agriculture estimates also indicate that this increasing efficiency has continued, and amounts to about 10 per cent during the decade since the war. This is a rate nearly two-thirds as rapid as the increase in population.

### PRODUCTION OF BEEF AND VEAL PER HEAD OF CATTLE

On the other hand, the increase in production of beef and veal per head of cattle on farms between the last two production cycles is slight (Fig. 17). As previously noted, the increasing efficiency of production caused by the increasing production of veal as compared with beef, and by improvement in quality of animals, was partly neutralized by the increasing number of dairy cows slaughtered. In the first cycle, 1897–1911, the average annual production of beef and veal was about 166 pounds per animal on farms January 1, and in the second cycle, 1912–28, the average annual production was about 178 pounds per animal on farms January 1.

### INCREASE IN NUMBER OF SWINE AND IN MARKET RECEIPTS IN WESTERN CORN BELT, 1920–22 COMPARED WITH 1925–27

For hogs, however, as for dairy cattle, there is strong evidence of rapidly increasing production per head and also per unit of feed consumed. Nearly half of the swine in the United States are in the states included in whole or in part in the Western Corn Belt—Iowa, Missouri, Kansas, Nebraska, South Dakota, and Minnesota. The net increase in number of swine in these states between the three-year periods 1920–22 and 1925–27, the centers of which are five years apart, amounted to about 15 per cent.[7] But the receipts of swine from these states at the thirty-six principal markets was 23 per cent greater during the period 1925–27 than during the period 1920–22.

### PRODUCTION OF SWINE AND CORN COMPARED IN WESTERN CORN BELT

Despite the 15 per cent increase in number of hogs on farms and the 23 per cent increase in number of hogs shipped to the principal markets from these six states, the production of corn, the principal feed for hogs in these states, was 6 per cent less in the period 1924–26 than in the period 1919–21, according to the estimates of the United States Department of Agriculture. The decrease in horses and mules in these states between the periods 1920–22 and 1925–27 averaged only 13 per cent. It is probable that the horses and mules in these states in the period 1920–22 did not eat a third as much corn as the hogs, consequently the decrease in corn required by the horses and mules is small compared with the increase in corn required to provide for the 15 per cent increase in number of

[7] The periods 1920–22 and 1925–27 seem to be fairly normal. The abnormal years 1923 and 1924 have been omitted. For the entire United States the estimated number of swine on farms January 1 are as follows (in thousands): 1917 = 56,192, 1918 = 61,310, 1919 = 63,387, 1920 = 59,813, 1921 = 58,711, 1922 = 59,355, 1923 = 68,447, 1924 = 65,937, 1925 = 55,568, 1926 = 52,148, 1927 = 54,408, 1928 = 58,969.

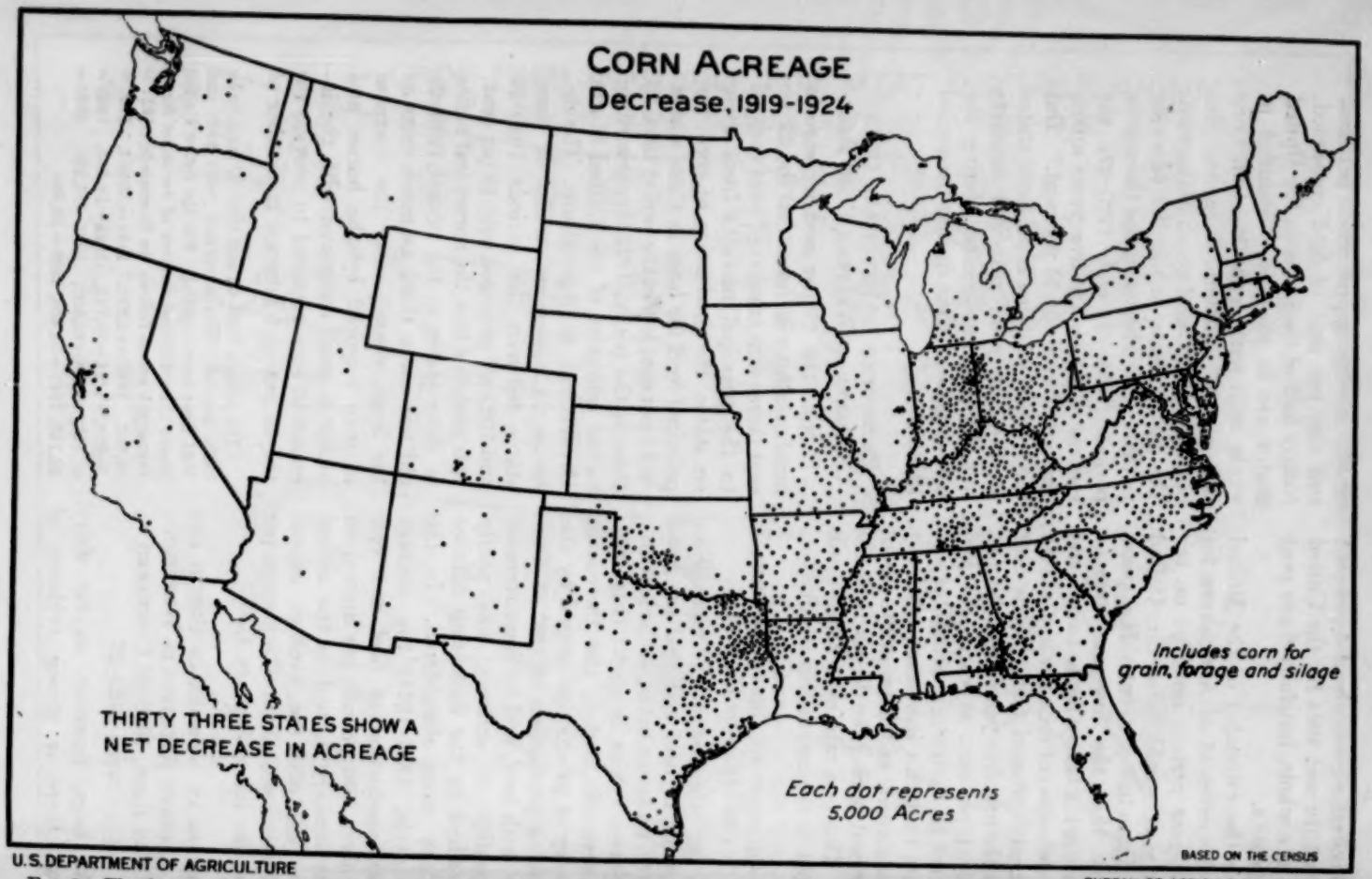
CORN ACREAGE
Decrease, 1919-1924
THIRTY THREE STATES SHOW A NET DECREASE IN ACREAGE
Each dot represents 5,000 Acres
Includes corn for grain, forage and silage
U.S. DEPARTMENT OF AGRICULTURE
BASED ON THE CENSUS
BUREAU OF AGRICULTURAL ECONOMICS

FIG. 6.—The decrease in corn acreage between 1919 and 1924 was practically confined to the originally forested portion of the United States, where the soils are naturally poorer than in the prairie portion, and was greatest, proportionally in the Southern States. In the Indiana and Ohio portion of the Corn Belt, the decline in corn acreage was only a part of the shift from crops (Fig. 15) to pasture (Fig. 4), resulting largely from the high wages obtainable in the near-by cities.

hogs on farms and 23 per cent increase in hog shipments, had no change occurred in efficiency of production.

It will be recalled that a notable increase in production of cattle and of milk in these states (about 13 per cent in cattle, 1920–23 to 1925–27, and 31 per cent in milk, 1919–24) also took place. It appears, therefore, that either a great reduction in shipments of feed from these states has occurred, or else a notable increase in efficiency of hog production with reference to corn required. The amount of corn shipped out of the county where grown increased from an average of 23.3 per cent in the years 1919–21 to 24.4 per cent in the years 1924–26, according to the returns made to the United States Department of Agriculture. As no significant change has taken place in the average weight of hogs slaughtered, and as hogs eat probably half the corn consumed in these states, it appears that a notable increase has occurred in production of pork and lard per unit of feed consumed.

This increase in efficiency of feed utilization in the Western Corn Belt seems to be fully as large a factor in causing the national increase in production per unit of feed consumed as the decrease in number of hogs in the Southern and most Eastern States, where the hogs are less productive per unit of feed consumed, and the increase in numbers in this Western Corn Belt, where the animals are more productive. Apparently the campaign for more sanitary methods of production, which has resulted in appreciably larger litters of pigs saved and reduced the losses from cholera and other diseases, the better feeding methods, especially the increasing use of legumes, and the use of better animals are accomplishing notable results.

This increase of pork production in the Western Corn Belt, and other factors, as already noted, has had disastrous effects upon the swine industry in many portions of the states to the southeast. In Kentucky the average number of swine on farms during the years 1925–27 inclusive was 31 per cent less than in the years 1920–22 inclusive, while the decrease in shipments to the principal markets, as reported, was 32 per cent. Many, probably most, of the hogs in the states south of the Ohio River are produced for home consumption, and the numbers of hogs raised for such purpose will be less affected by competition than those raised for sale. The corresponding figures for Tennessee are 42 per cent decrease in number of swine on farms and 53 per cent decrease in shipments; for Oklahoma 33 per cent and 45 per cent decrease respectively, for Texas 49 per cent and 47 per cent decrease. For the Central and Eastern Cotton Belt States, from Arkansas and Louisiana to and including North Carolina and Florida (but excluding Tennessee), the decrease in hogs on farms averaged 37 per cent, while in the Virginias the decrease average was 33 per cent. Adequate data on shipments of hogs from farms in these Southeastern States are not available, and in any case would be of little significance.

Unless the consumption of pork has decreased notably in these Southern States, an increase in shipments of pork into these states should be expected. Information supplied by two of the large packers indicates an average increase between 1920–22 and 1925–27 of about 20 per cent in their sales in the region south of the Potomac and Ohio Rivers and east of Texas and Oklahoma.

### CHANGES IN PRODUCTION OF PORK AND LARD

Unlike cattle, the number of swine in the United States has increased

the decline in corn acreage was only a part of the shift from crops (Fig. 15) to pasture (Fig. 4), resulting largely from the high wages obtainable in the near-by cities.

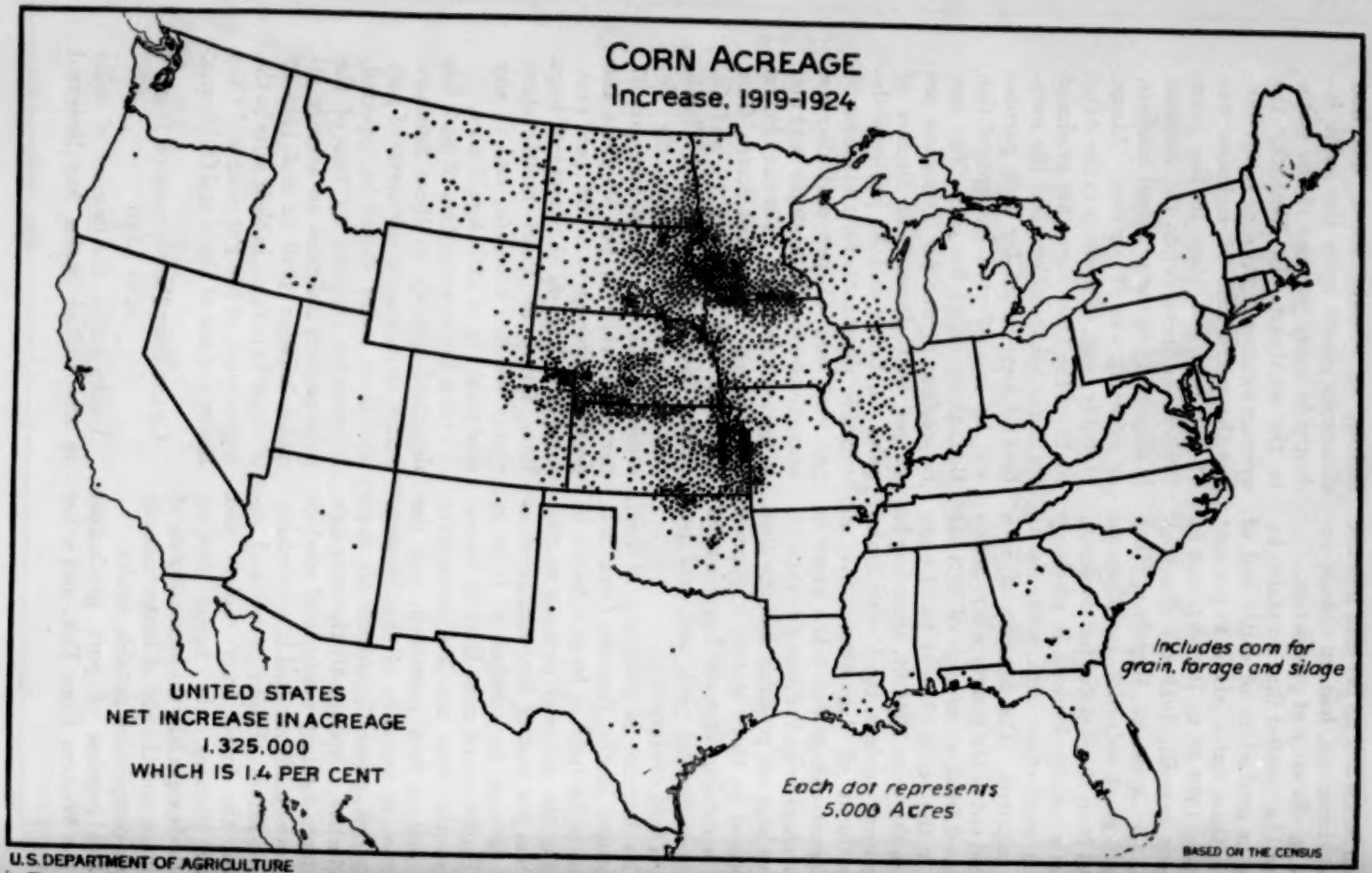


FIG. 7.—In most of the region where the acreage of corn harvested increased between 1919 and 1924, the acreage of wheat decreased notably, and in the Dakotas there occurred also a considerable decrease in hay acreage. In southwestern Minnesota the increase in corn acreage was partly owing to a drought in 1919, and partly to drainage of land between 1919 and 1924. Partly as a consequence of the geographic shift in corn acreage the production of pork and lard has been greater than ever before.

notably during the past quarter century, and also unlike cattle there has been an even more notable increase in production of meat per animal on farms January 1. As already noted, this increase in production per head, apparently, has taken place wholly since 1920. Prior to 1921, during the three cycles of numbers of swine on farms and of meat production (which, unlike cattle, coincide), 1902–09, 1910–16, 1917–20, the annual production of pork and lard per head of swine on farms January 1 was about 154,162, and 155 pounds respectively. In the cycle 1921–25, inclusive, the production per head was about 177 pounds, and in the two years 1926 and 1927 it was about 210 pounds.

### CHANGES IN PRODUCTION OF MUTTON, LAMB AND WOOL

Although the number of sheep in the United States in 1928 was no greater than at the beginning of the century, and from 1912 to 1927 was considerably smaller than from 1900 to 1911, the production of wool has been fairly well maintained and the production of mutton and lamb, considered jointly, has increased. The cycles of number of sheep on farms and ranges and of production of mutton and lamb and of wool are even less regular in length than those of swine. The year 1905 marks the ebb of a cycle, 1917 another ebb, and 1922 a third ebb in numbers. Comparing the number of sheep and lambs on farms and ranges in the periods 1900–04, 1905–16, 1917–21 and 1922–27 with the production of mutton and lamb, the following figures of production per animal, result: 12.3 pounds, 14.8 pounds, 14.1 pounds, 15.6 pounds respectively. This indicates the increase may have been as much as 25 per cent in the quarter century. The corresponding figures of production of wool per sheep (or lamb) on farms, January 1, in these four periods are 6.6 pounds, 7.1 pounds, 7.5 pounds and 7.6 pounds respectively. It appears that the trend toward meat breeds in the sheep industry has not prevented an increased production of wool per animal in the past quarter century.

Owing to the fact that many sheep are shipped from the range region into the Corn Belt for fattening, it is not feasible to estimate changes in amount of feed consumed, but since most of the slaughter a quarter century ago was of sheep and is now of lambs, it appears very probable that a notable increase in production of meat per unit of feed consumed has taken place.

With regard to poultry the data are even less adequate on which to base estimates of production per unit of feed consumed.

Let us now consider the third factor that has promoted the increase in agricultural production.

### THE SHIFT FROM LESS EFFICIENT TOWARD MORE EFFICIENT CLASSES OF LIVESTOCK

Dairy cows and hogs require much less feed to produce an equivalent amount of human food than do beef cattle and sheep. Several years ago the Division of Land Economics made a study, based on cost of production records, and found that whereas hogs in the central Corn Belt required only about 2½ acres of crops (mostly corn) to produce 1,400,000 calories of food (the number consumed annually by the average person in the United States), milk cows in Wisconsin required 2⅔ acres of crops (mostly hay and silage) and 1¼ acre of pasture to produce an equivalent number of calories. However, the land in the Corn Belt farms, devoted largely to corn, is more productive than the land in the Wisconsin

Dakotas there occurred also a considerable decrease in hay acreage. In southwestern Minnesota the increase in corn acreage was partly owing to a drought in 1919, and partly to drainage of land between 1919 and 1924. Partly as a consequence of the geographic shift in corn acreage the production of pork and lard has been greater than ever before.

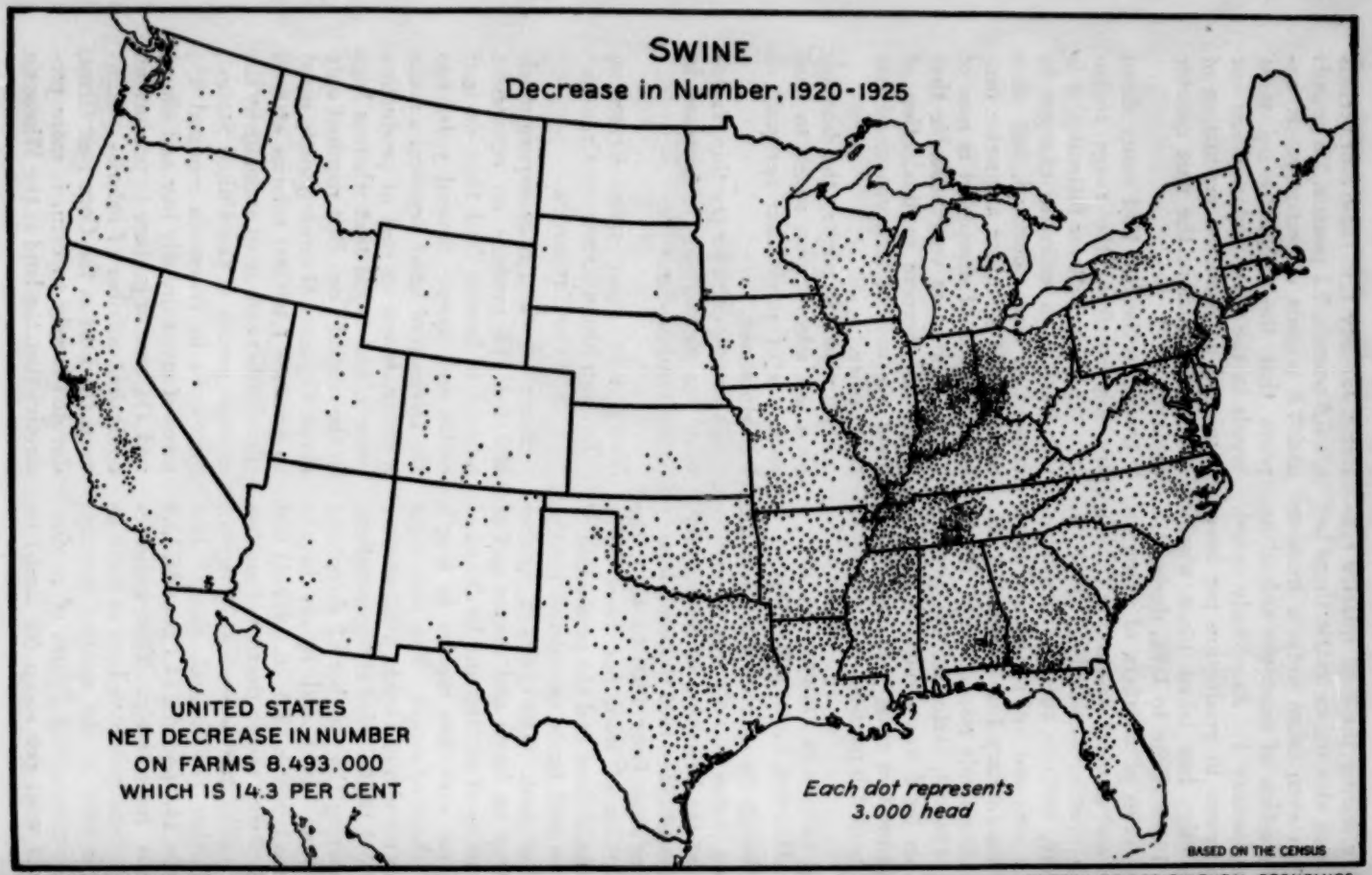


FIG. 8.—The decrease in hogs between 1919 and 1924 was almost confined to the originally forested portion of the United States, like that of corn, but extended a little farther to the north and west; also a decrease occurred in California. These are feed deficit regions, usually, except the eastern Corn Belt. Despite the 14 per cent decrease in the nation's hogs between January 1, 1920 and 1925, there was about 14 per cent more pork and lard produced in 1924 than in 1919, and 7 per cent more in 1925 than in 1920.

farms, devoted largely to hay, and it appears that the ratio of feed consumed to food produced is slightly lower for the dairy cow than for the hog. For beef cattle in the Corn Belt, on the other hand, an average area of 15½ acres of crops and 2½ acres of pasture was required to produce 1,400,000 calories of beef, or about six times as much crop land as that required by dairy cows or hogs[8] (Fig. 21). It is evident, therefore, that a trend from beef production toward pork and milk will reduce greatly the acreage of crops required to produce the nation's food.

The number of beef cattle in the United States is now smaller than 40 years ago, the increase in beef production in recent years having been mostly at the expense of the breeding stock. The number of sheep also has remained more or less constant for 40 years or more. Milk cows, on the other hand, increased rapidly up till about 1909, then remained stationary for 6 or 7 years, increased slowly until about 1925, and are now decreasing, according to the estimates of the Bureau of Agricultural Economics, but are still nearly 50 per cent greater in number than 40 years ago. Milk cows have increased a half to two-thirds as rapidly in number as has human population. Moreover, since production of milk per cow has become notably greater, the production of milk continues to increase since the World War more rapidly than population. The increase in number of swine has also been notable. The number on farms January 1, 1928, was a third greater than 40 years ago, but in 1923 and 1924 it was 50 per cent greater, and the trend is now upward again. Like milk, the production of pork and lard since the World War has increased more rapidly than population.

This trend from the less productive classes of farm animals per unit of feed consumed (beef cattle and sheep) toward the more productive classes (dairy cattle and hogs) has been a less important factor in increasing agricultural production since the World War than the introduction of the tractor and automobile, or the increasing productivity of each class of food producing animal, nevertheless, it accounts apparently, for about one-fifth of the increase in animal products.

### THE SHIFT FROM LESS PRODUCTIVE TOWARD MORE PRODUCTIVE CROPS PER ACRE

The shift from less productive toward more productive crops has been a more important factor in increasing agricultural production since the World War than the shift from less productive toward more productive livestock. Comparing the period 1917–21 with the period 1922–26, it appears that this factor accounts for about two-thirds of the total increase in production of the crops not fed to farm animals, or fully one-fifth of the total increase in agricultural production. The principal changes have been toward less wheat and more corn in the Corn Belt and Central Great Plains, less corn and more cotton in the South, and the rapid expansion of fruit and vegetable production in California and Florida

[8] This great difference in acreage required is owing only in part to difference in production of meat per unit of feed consumed. Roughly the hog requires 5 pounds of corn or equivalent to produce a pound of hog live weight, whereas the beef requires about 10 pounds of corn and equivalent feed. Then the hog dresses out 75 to 80 per cent edible meat and lard, whereas the beef dresses out only about 56 per cent. Lastly, pork and lard in the proportions derived from slaughter average about 2,000 calories of energy per pound, whereas beef averages only 1,000 calories. Thus 5,000 pounds of corn and other feed fed to hogs results in about 770 pounds of edible pork and lard, and fed to steers, to 280 pounds of edible beef, which on burning develop about 1,540,000 and 280,000 calories respectively.

extended a little farther to the north and west; also a decrease occurred in California. These are food deficit regions, usually, except the eastern Corn Belt. Despite the 14 per cent decrease in the nation's hogs between January 1, 1920 and 1925, there was about 14 per cent more pork and lard produced in 1924 than in 1910, and 7 per cent more in 1925 than in 1920.

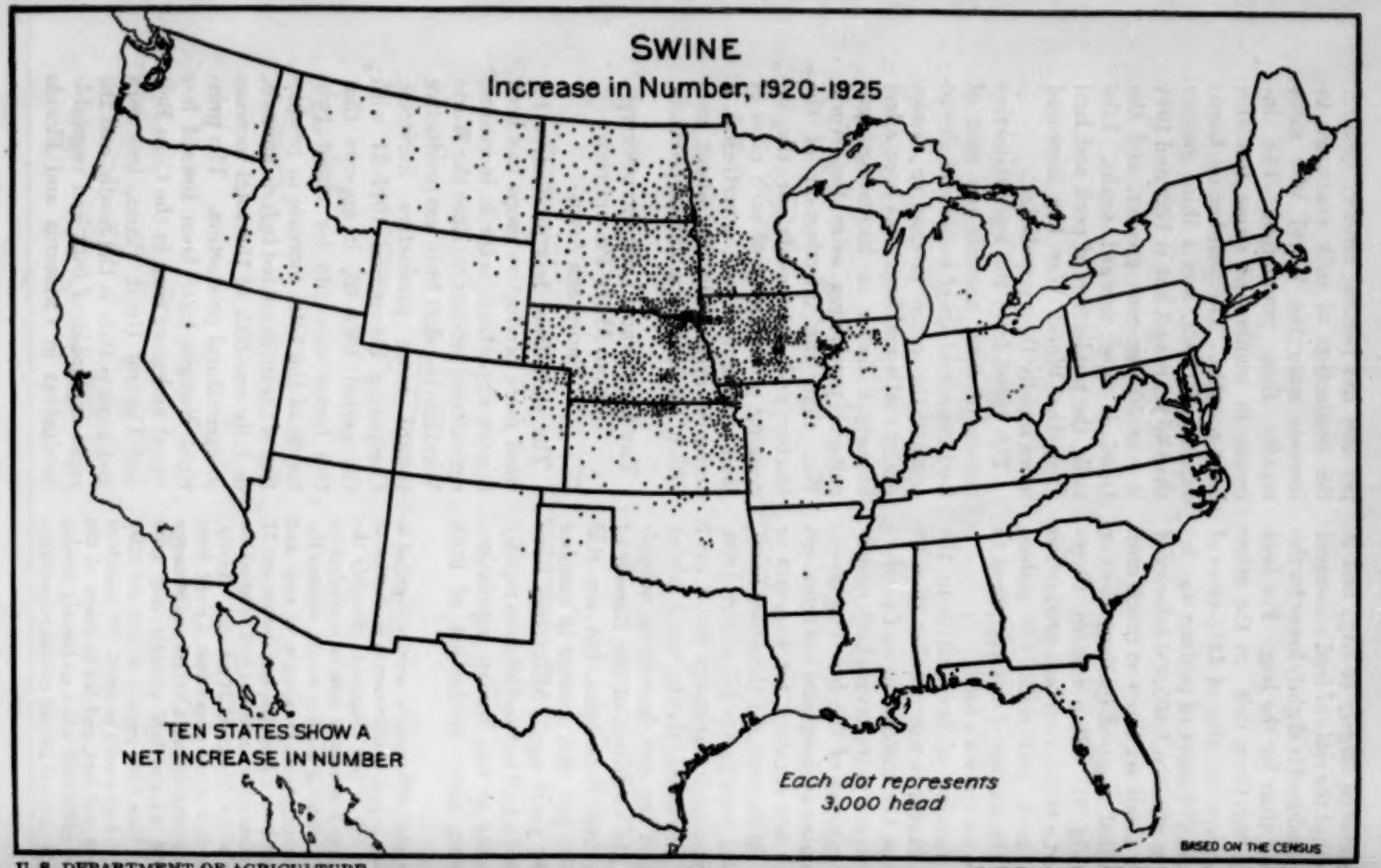


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FIG. 9.—The increase in number of hogs between 1920 and 1925 was notable in the western Corn Belt and in the Spring Wheat Region to the north, where the price of corn is the lowest in the United States. In these states there was a rapid shift from wheat toward corn and oats, while the number of horses decreased (Figs. 2 and 3), and the acreage of harvested crops increased (Fig. 16). It will be noted, upon comparing this map with Figure 7, that the increase in hogs was not quite as widespread as that of corn.

especially, sometimes at the expense of other crops and even of pasture and forest.

### INCREASE IN YIELD PER ACRE OF THE CROPS

A study made by the Division of Land Economics some years ago indicated that the composite acre-yield of corn, wheat, oats and potatoes increased 15 per cent between the period 1885–89 and the period 1905–09, and that over half of this increase occurred in the last five years of this 20-year span. But since 1910 the composite acre-yields of these crops have remained practically stationary.[9]

More recently in studying the changes in land utilization since the war, the Division of Land Economics has compiled statistics showing acre-yield of the crops used for human food, used for feed, and used for industrial purposes. These figures show among the food crops a slightly higher acre-yield of wheat, rice, potatoes, sugar beets, apples and peaches in the period 1922–26 than in the period 1917–21 for the nation as a whole, but a decrease in the acre-yields of sweet potatoes and the citrus fruits. For many food crops the geographic shifts in acreage and acre-yields balanced each other, so that the acre-yields for the nation as a whole remained practically stationary. The net result was a slight contribution to the increase in agricultural production.

Among the feed crops there was a slight increase in the acre-yields of hay and barley, which was almost balanced by a slight decrease in the acre-yield of corn. The acre-yield of oats remained stationary. For all feed crops the decrease indicated between the periods 1917–21 and 1922–26 is 1.7 per cent in acreage and 1.4 per cent in production.

But among the industrial crops, principally cotton, flax and tobacco, there was an increase of 21 per cent in acreage and of 16 per cent in production, indicating an appreciable decrease in acre-yields, which is attributable principally to the advance of the boll weevil in the Cotton Belt. However, during the years 1924–26, the acre-yield of cotton was higher than in any period of years since 1915.

Taking all the crops together and excluding the changes in production assignable to shifts from one crop to another, there was a net increase in average acre-yields between the periods 1917–21 and 1922–26 of about 1½ per cent, which is practically one-tenth of the increase in total agricultural production.

### SUMMARY OF AGRICULTURAL PRODUCTION

In summation of the changes in agricultural production since the World War we may keep these major facts in mind:

1. The total acreage of the crops and of the pastures has remained practically stationary.

2. Comparing the five-year period 1917–21 with the period 1922–26, an aggregate increase in agricultural production of 13.5 per cent is indicated. That is, population increased from 100 to 108, agricultural production from 100 to 113.5. The increase in production per capita was, therefore, about 5 per cent.

3. Over two-thirds of this increase is attributable to animal products and somewhat less than one-third to plant products.

4. Of the increase in animal products about two-fifths is assignable to the tractor, another two-fifths to increasing production of meat and milk

[9] "The Trend Toward a More Effective Use of the Land as Shown by the Yield per Acre of Certain Crops," by B. O. Weitz, United States Department of Agriculture, Bulletin No. 1458.

...where the price of corn is the lowest in the United States. In these states there was a rapid shift from wheat toward corn and oats, while the number of horses decreased (Figs. 8 and 9), and the acreage of harvested crops increased (Fig. 10). It will be noted, upon comparing this map with Figure 7, that the increase in hogs was not quite as widespread as that of corn.

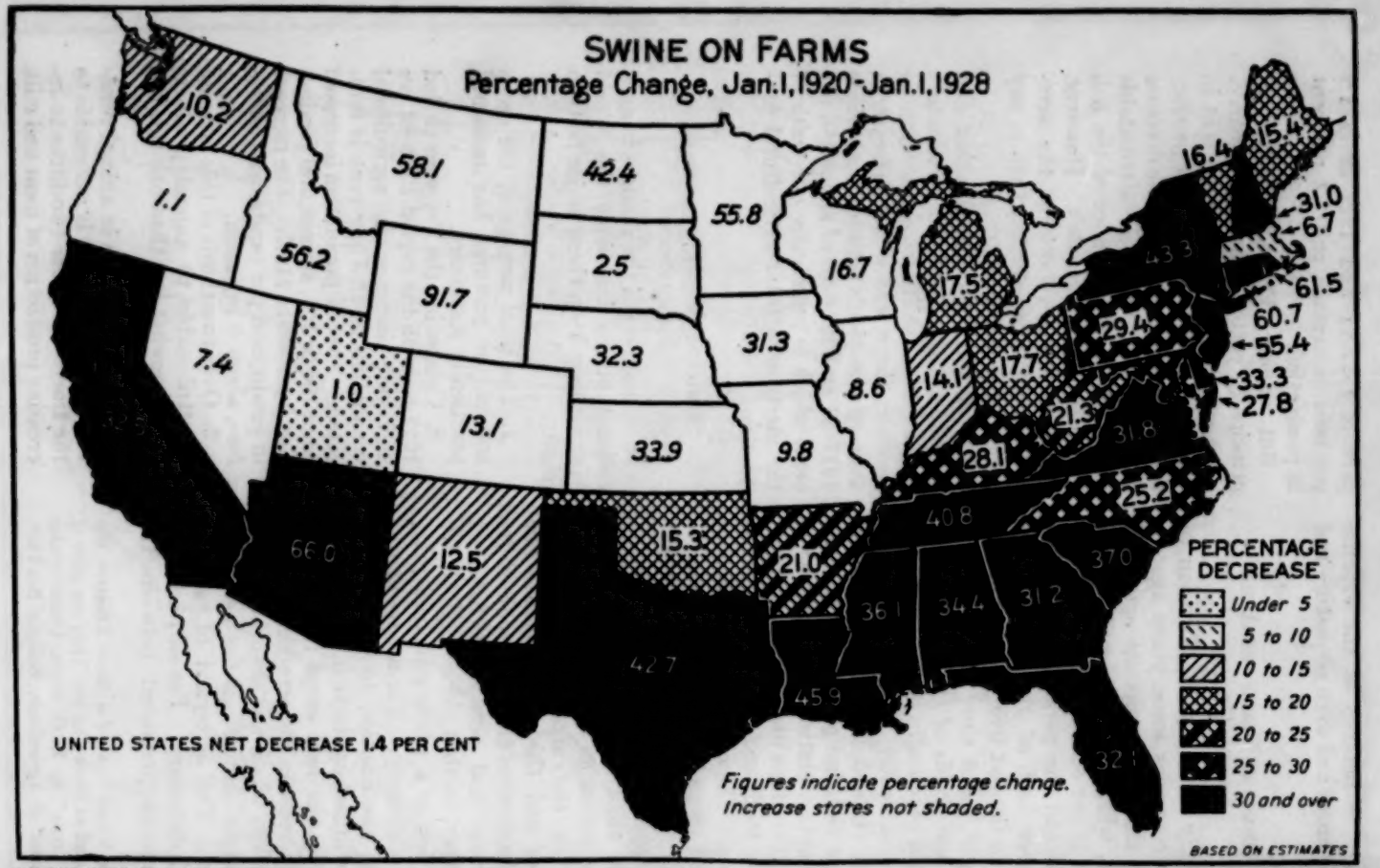


FIG. 10.—In every dominantly prairie and plains state the number of hogs increased between 1920 and 1928. The average for the states shown white on the map was 26 per cent. On the other hand, the area of decline included every state in the originally forested portion of the United States, except Wisconsin. In this region the soils, in general, are poorer, especially in the South, and the price of corn is higher. In only Ohio, Indiana and Oklahoma out of the 33 states in which a decrease in hogs occurred did the price of corn average less than 70 cents during the period 1920–27; while in all the states in which an increase in hogs occurred the price averaged less than 70 cents, except in Wisconsin and four of the far Western States.

per unit of feed consumed, and one-fifth to the shift from the less efficient toward the more efficient classes of farm animals in transforming feed into food.

5. Of the increase in plant products, about two-thirds is assignable to the shift from the less productive to the more productive crops per acre, and about one-third to increase in yields per acre of several food crops.

6. This increase in production has continued during 1927 and 1928, and as the substitution of tractors for horses and mules, appears inevitable for several years to come, since there are not half enough colts on farms to replace the horses that die, and as improvements in the efficiency of livestock in transforming feed into food appear likely to continue, while it is not improbable that, with the wider use of fertilizers, especially in the Central and Far West, acre-yields of the crops will soon advance, it appears likely that agricultural production will increase for several years at about the present rate.[10]

7. However, the two factors of shifts from less productive toward more productive classes of animals per unit of feed consumed, that is, from beef cattle and sheep toward dairy cattle and hogs, and from less productive toward more productive crops per acre, principally from wheat toward corn in the North and from corn toward cotton in the South and from cereal foods toward fruits and vegetables and sugar, may diminish in importance and gradually cease. In this case it would seem reasonable to expect a slight expansion in total crop acreage, and also improvement in the general agricultural situation. But if the American people should begin eating less meat and milk and more cereal foods, conditions might rapidly become worse rather than better. So it seems worth while to consider the changes in consumption of agricultural products during the quarter century, and what the trend is.

[10] The December estimates of the United States Bureau of Agricultural Economics indicate the following increases in production of the major cereals in 1928 over the average production for the period 1922–26:

| | *Million Bushels* | *Per Cent* |
|---|---|---|
| Wheat..... | 95 | 12 |
| Corn..... | 64 | 2 |
| Oats..... | 98 | 7 |
| Barley..... | 165 | 86 |
| Sorghums ... | 52 | 58 |
| Total..... | 474 | 9 |

## CHANGES IN CONSUMPTION OF AGRICULTURAL PRODUCTS SINCE 1900

These data on consumption of agricultural products are tentative, as the work on several commodities is not yet complete, and some of the calculations still await checking. Let us consider first the changes in consumption per capita of the foodstuffs from plants, beginning with wheat.

### CHANGES IN CONSUMPTION OF PLANT FOODSTUFFS

*Wheat.*—The consumption of wheat flour per person, according to the careful studies of the Food Research Institute at Stanford University, which we have accepted without change, averaged 224 pounds during the period July 1, 1897 to June 30, 1902, dropped to 220 pounds during the next five-year period, to 211 pounds in the next period and then to 203 pounds in the pre-war period 1912–17. After the United States entered the World War there was an abrupt drop to 176 pounds (in 1917–18), or over 10 per cent. However, the consumption since has remained almost stationary at this point, the average for the period 1922–27 being also 176 pounds. Apparently, the prosperity of the urban people has permitted them to eat more meat and milk and vegetables and, consequently,

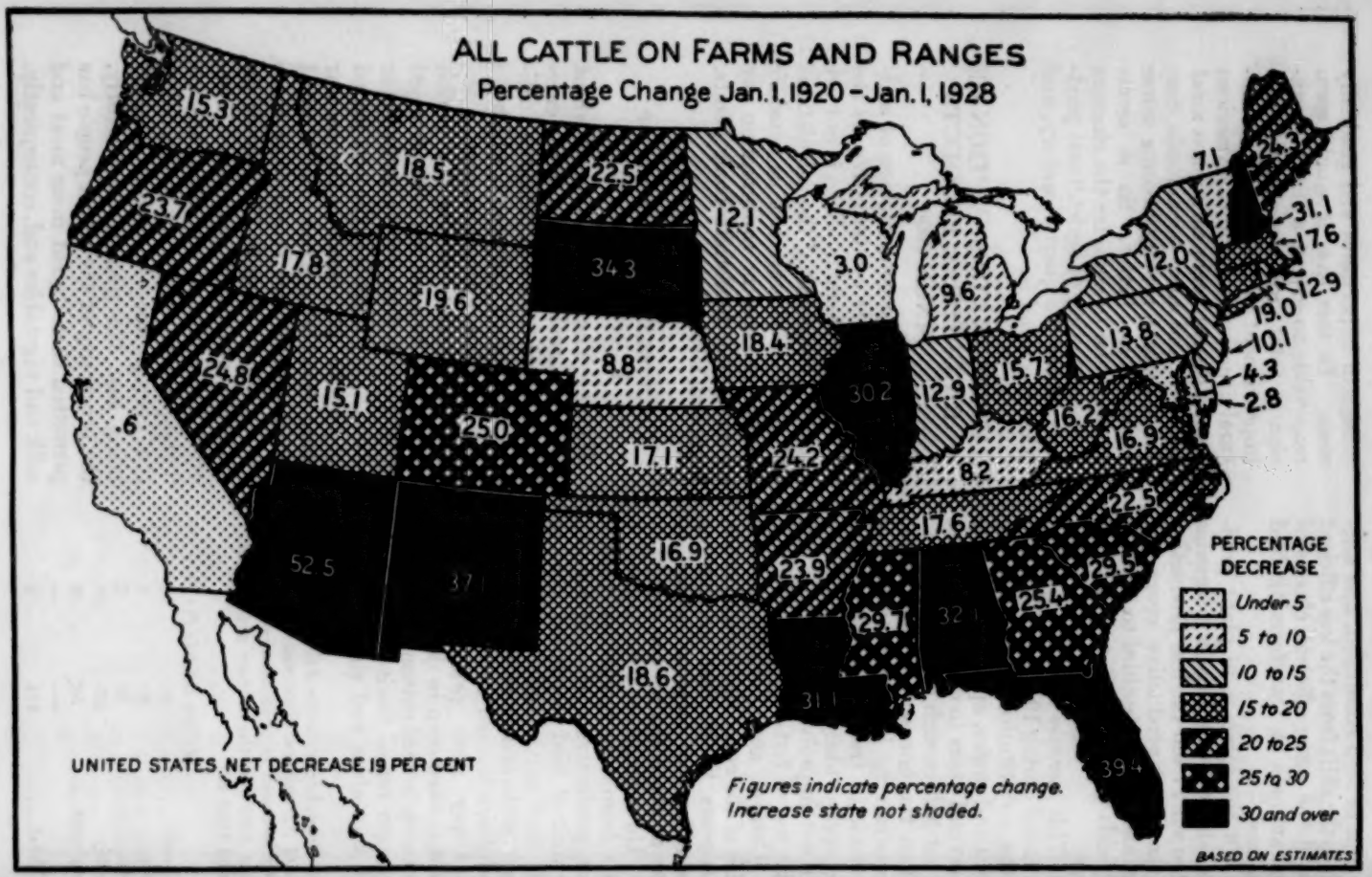


FIG. 11.—Every state shows a decrease in number of cattle between 1920 and 1928, except Delaware. The greatest regional decrease, proportionately, was in the eastern and central Cotton Belt, where it averaged 28 per cent; but it was even higher in Arizona, New Mexico, Illinois and South Dakota, in the latter state because of three dry seasons. The least decrease was in the dairy states of the North and Northeast, and in Kentucky, Nebraska and California. For the United States as a whole, dairy cattle increased about 2 per cent and beef cattle decreased nearly 25 per cent.

less bread; while, probably, the great increase in consumption of sugar has been also an important factor. Whatever the cause, the fact remains that wheat bread, which to many, perhaps most, peoples of the world is a luxury, has occupied a place of lesser importance in the diet of the American people during and since the World War, while the per capita consumption of the more expensive foods has increased.

*Corn.*—The consumption of corn for human food has decreased greatly during the past quarter century. Information as to the amount of corn used for human food is far less reliable than for wheat, owing to the fact that corn meal is used for the feeding of farm animals as well as by human beings. But by using all information available it has been possible to construct an index of consumption for food, which is doubtless reliable as an indication of the trend. According to this index the average consumption was about 120 pounds in the five-year period January 1, 1898 to December 31, 1902, and has decreased almost constantly since to about 46 pounds during the period 1923–27.[11] This is a decrease of fully 60 per cent. Much of this decrease is owing to the rising standard of living and increasing use of wheat flour and other foods by both negroes and whites in the South, where corn has been used for human food more extensively than elsewhere, and to the increasing proportion of the people who live in the cities, where little corn bread is baked in homes and even less by bakers.

*Rye.*—The decline in use of rye flour has been about as great proportionately as of corn meal. During the period 1897–1902, and also during 1902–07, it averaged, apparently, 7 pounds per person, dropping to less than 6 pounds during the decade 1907–17. Then it suddenly dropped to less than 3 pounds during the war years and has remained at about 2.6 pounds since.

*Barley.*—Prior to prohibition barley was used for human food mostly in the manufacture of beer, and since prohibition for malt extracts and cereal beverages. A little is also used as pearl barley in soups. During the period 1897–1902 the average consumption for human food was about 17 pounds per capita, rising to about 21 pounds in the three succeeding periods. For the period 1917–22 there was a sudden drop to about 6 pounds, and during the period 1923–27 the average was only about 2 pounds, an insignificant amount.

*Potatoes.*—The per capita consumption of potatoes during the first five-year period July 1, 1897, to June 30, 1902, was, apparently, subnormal. The average for this period is only 2.3 bushels per person. Since 1901 each five-year period gives an average per capita consumption of either 2.9 or 3.0 bushels, which is remarkably uniform. Although there is often wide fluctuation from one year to the next, there is no permanent change apparent in the use of potatoes in the diet of the American people.

*Vegetables.*—Information on consumption of vegetables is very deficient prior to 1917, when the Bureau of Agricultural Economics began collecting data on carload shipments, and even since 1917 data on consumption on farms and in other homes having gardens is very scant. However, on the basis of all existing information, mostly census figures on acreage, an index has been constructed. According to this index consumption per capita was rather low during the first five-year

[11] Since corn is harvested late in the fall, whereas the small grains are harvested in the summer, consumption is calculated for corn for the calendar year following harvest, rather than the fiscal year, as for small grains.

was in the eastern and central Cotton Belt, where it averaged 23 per cent; but it was even higher in Arizona, New Mexico, Illinois and South Dakota, in the latter state because of three dry seasons. The least decrease was in the dairy states of the North and Northeast, and in Kentucky, Nebraska and California. For the United States as a whole, dairy cattle increased about 2 per cent and beef cattle decreased nearly 25 per cent.

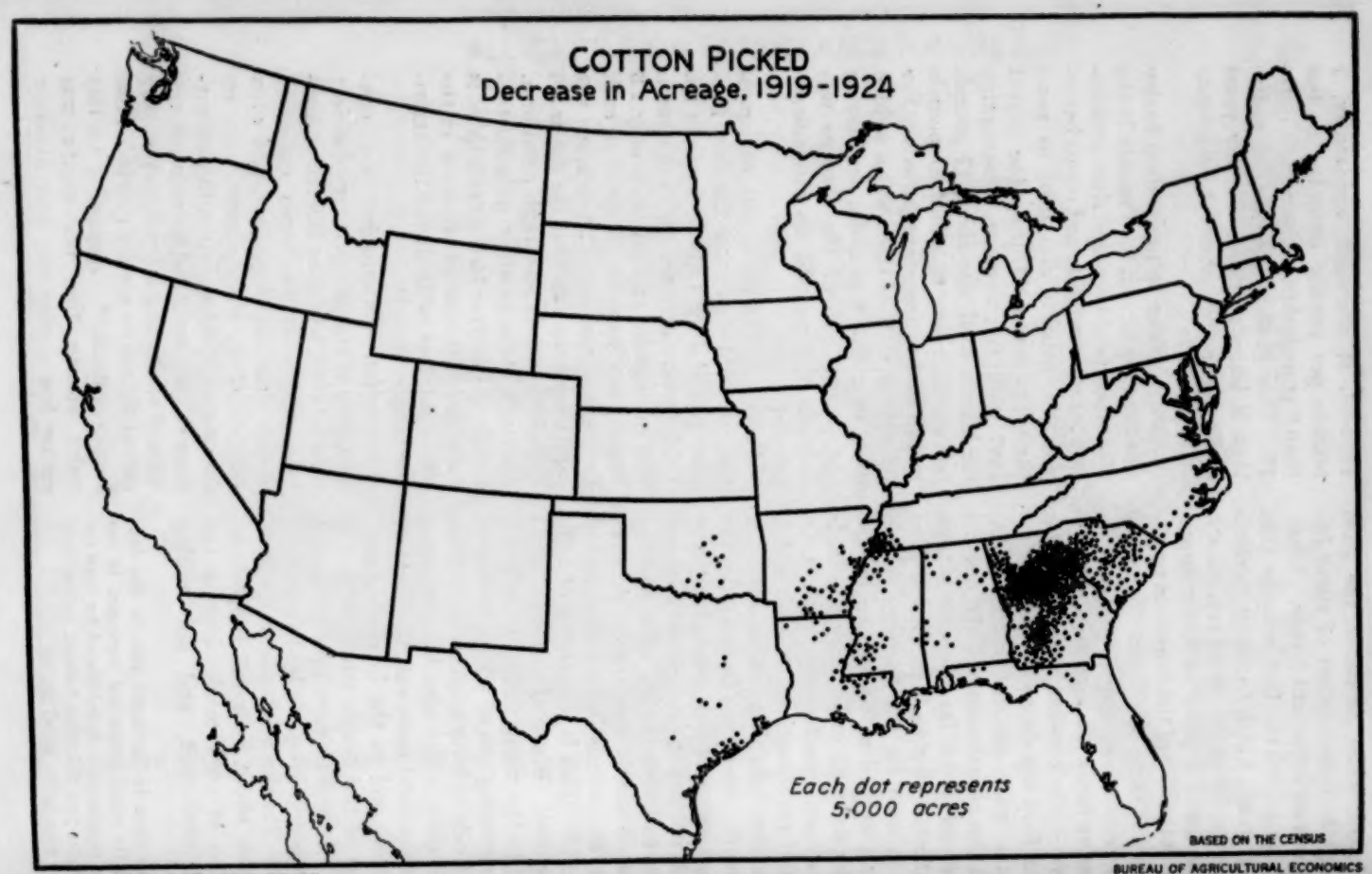


FIG. 12.—The decrease in cotton acreage between 1919 and 1924 was notable in Georgia and South Carolina, and a smaller decrease is indicated also in the area around Memphis and southward. The decrease in Georgia and South Carolina was associated with the advance of the boll weevil, and also with the high wages offered in near-by manufacturing towns as well as in northern cities. Perhaps an even greater factor, however, was competition with more cheaply produced cotton in Texas and Oklahoma.

period, 1897–1902, then rose gradually during the next five years and thereafter remained practically stationary until 1920. After a slump in 1921, the upward trend was resumed and reached its highest point in 1925. During the period 1922–27 consumption per capita apparently, was about 15 per cent greater than in the three preceding periods.

*Fruits.*—Information on production of fruits is excellent for California, owing in large part to the splendid research work of the California Agricultural Experiment Station, but for production in other states it is incomplete except for apples. The estimates of fruit consumption must, therefore, be considered little more than guesses for the years prior to 1917. The estimates indicate a consumption per capita averaging about 173 pounds during the five-year period 1897–1901, which rose to 181 pounds during the period 1902–06, then fell to 154 pounds during the years 1907–11, when the complaint of the high cost of living was general; during the period 1912–16 it rose again to 183 pounds, and fell again to 154 pounds during the war and post-war period 1917–21, finally rising to 178 pounds during the period 1922–26. This is about the same per capita consumption as during the first two periods studied, 1897–1906. There has been, however, a notable shift from apples toward citrus fruits and grapes.

*Sugar.*—The statistics of consumption of sugar are the best of all statistics on foodstuffs. These figures show an increase in per capita consumption of nearly 40 per cent between the beginning of the century and the period 1918–22, and of 16 per cent more in the period 1923–27 above that in 1918–22. The per capita consumption in each five-year period was as follows: 68 pounds in 1898–1902, 74 pounds in 1903–07, 79 pounds in 1908–12, 83 pounds in 1913–17, 94 pounds in 1918–22, and 109 pounds in 1923–27. Prohibition of the use of alcoholic liquors went into effect July 1, 1918, but wartime restriction on use of sugar was not removed until late in 1920.

This increasing consumption of sugar has undoubtedly exerted an influence upon the consumption of cereal foods, and it seems likely also that the decreased consumption of proteins of vegetable origin (the cereals contain protein, but sugar does not) may have been a factor in the increase in consumption of proteins of animal origin. About 12 per cent of the food supply of the American people, measured in calories, now comes from the tropics, and this is nearly all sugar.

*Summary.*—The per capita consumption of the cereals, except rice, has decreased during the past quarter of a century, especially during and since the World War. Comparing the periods 1897–1902 with 1922–27, which are 25 years apart, the per capita consumption of wheat flour has decreased over 20 per cent, of corn for food over 60 per cent, of rye flour about 60 per cent, and of barley, used to manufacture beer and similar products, nearly 90 per cent. But the consumption of oatmeal, which is small, probably has remained about stationary. Similarly the consumption of potatoes per capita, excluding the first period, 1897–1902, has remained stationary, and the per capita consumption of fruits is now about the same as a quarter century ago. Only the vegetables and sugar among the major plant foodstuffs show an increase. The increase in consumption of vegetables is practically confined to the years since the World War, but the increase in consumption of sugar has been almost continuous for a century. However, the most rapid increase has occurred since the World War.

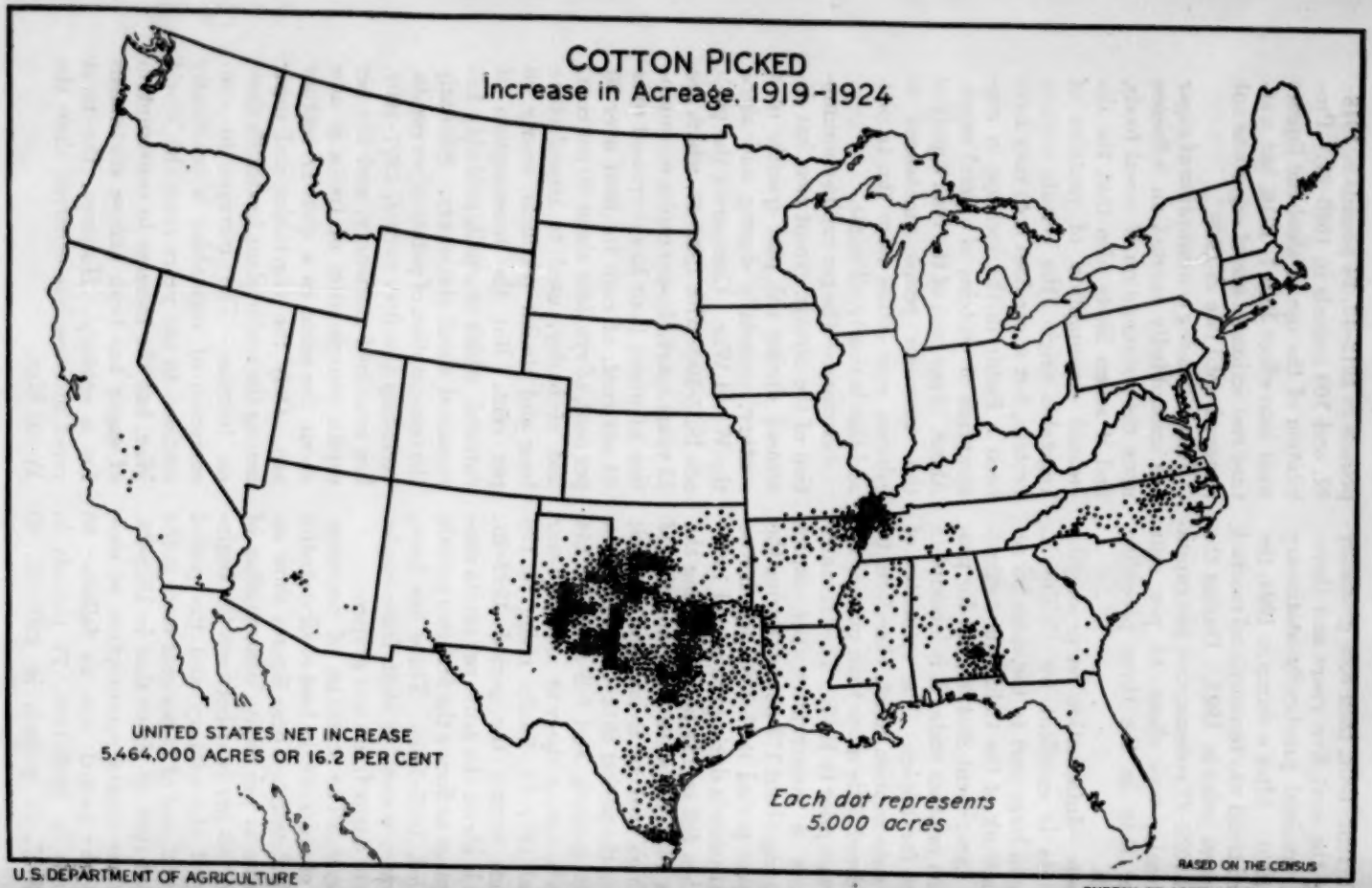


FIG. 13.—The increase in cotton acreage between 1919 and 1924 was notable in Texas and much of Oklahoma, in the upper end of the Mississippi River Delta, in southeastern Alabama, and in much of North Carolina. The increase occurred mostly in the drier, western portion of the Cotton Belt and along the northern margin, where boll-weevil damage is less, or non-existent. In Georgia and South Carolina the Cotton Belt abuts the mountains, and the marginal zone, where expansion might occur, is very narrow.

This increase in consumption of sugar and the vegetables is not sufficient to balance the decrease in consumption of wheat and rye flour and corn meal. The question, therefore, arises, what are the people eating to make up for this decline in consumption of cereal foods? Are they eating more meat or milk?

### CHANGES IN CONSUMPTION OF ANIMAL FOODSTUFFS

*Beef and Veal.*—The consumption of beef per capita at the beginning of the twentieth century (1897–1901) was about 67 pounds, and of veal 3 pounds, or 70 pounds for both products.[12] In the period 1902–06 the consumption of beef rose to 73 pounds, and of veal to 5 pounds, and this consumption continued, with yearly fluctuations, until 1911. Then came a slump to a consumption of 58 pounds of beef during the period 1912–16, veal remaining at about 5 pounds. During the war and post-war years consumption of beef rose to 61 pounds for the period 1917–21 and 62 pounds for the period 1922–26. But consumption of veal rose to 7 and 8 pounds respectively. During this last period, 1922–26, therefore, the combined consumption of beef and veal was about 70 pounds, or the same amount as at the beginning of the century. But the consumption of beef has declined nearly 8 per cent, while consumption of veal has more than doubled. It is evident that these changes in per capita consumption of beef and veal, considered jointly, cannot balance the decline in consumption of cereal foods during the past quarter century. Moreover, it appears probable that per capita consumption of beef will decline during the next few years, owing to the great depletion of breeding stock, and increase of human population.

*Mutton and Lamb.*—The changes in consumption of mutton and lamb are even less able to balance the decline in consumption of cereal foodstuffs. The century began with a consumption of 6.8 pounds per person (1897–1901), and this continued during the next decade, 1902–11. Then it rose to an average of 7.1 pounds during the period 1912–16, but fell precipitately to 4.6 pounds in 1917, and has since remained at a little above 5 pounds. During the period 1922–26 per capita consumption averaged nearly 25 per cent less than 25 years before.

*Pork and Lard.*—The per capita consumption of pork and lard was about 77 pounds at the beginning of the century (1897–1901), then declined to 71 pounds in the five-year period 1902–06, complementing a somewhat greater increase (8 pounds) in the consumption of beef and veal. During the next five-year period, 1907–11, consumption of pork and lard rose 3.5 pounds, and during the following five-year period fell a pound. Figures for the war and early post-war years, 1917–21, indicate a further drop of over 4 pounds, the average for this period being only 69 pounds. Then came the amazing rise to an average consumption per person of 84 pounds during the period 1922–26. During the years 1923 and 1924 consumption was 90 pounds per person. This increase of 9 per cent in consumption of pork and lard since the beginning of the century (1897–1901 compared with 1922–26) goes a long way toward balancing the deficit in consumption of wheat and other cereals, for pork, including lard, is one of the major items of diet.

[12] These estimates of meat consumption (except for the three years prior to 1900) are taken, practically without change, from the compilations of John Roberts, United States Bureau of Animal Industry, issued in mimeograph form under the title "Meat Production, Consumption and Foreign Trade in United States, Calendar Years, 1900–27."

Delta, in southeastern Alabama, and in much of North Carolina. The increase occurred mostly in the drier, western portion of the Cotton Belt and along the northern margin, where boll-weevil damage is less, or non-existent. In Georgia and South Carolina the Cotton Belt abuts the mountains, and the marginal zone, where expansion might occur, is very narrow.

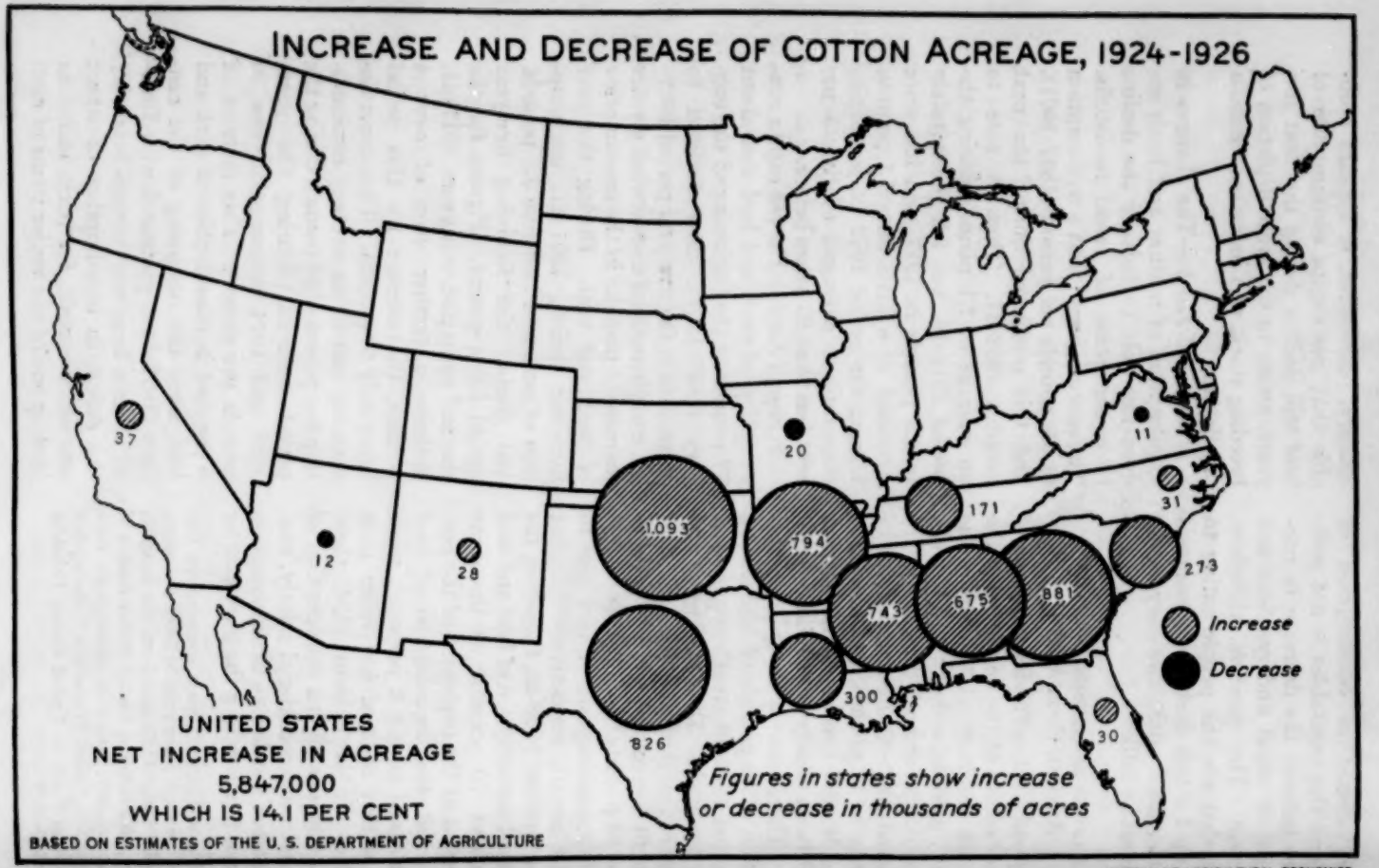


FIG. 14.—Between 1924 and 1926 a great increase in cotton acreage occurred, in the eastern as well as the western Cotton Belt. The net increase in acreage for the United States as a whole was as great as the net increase had been in the previous five years. However, in Georgia and South Carolina the increase was not half as great as the decrease had been in the previous five years. In 1927 the nation's acreage was much smaller, but in 1928 it rose again nearly to the 1926 level.

*Milk.*—The remainder of the deficit is practically made up by the increase in consumption of milk. It has been difficult to construct an index of milk production and consumption, but it is our belief that these estimates, which are based mostly on the Census of Manufactures, reports on farm consumption from crop reporters of the Bureau of Agricultural Economics, and reports from boards of health in 250 to 300 cities, compiled by the Dairy and Poultry Division of the Bureau, are not far wrong. These indicate a per capita consumption of all dairy products reduced to a milk basis of about 880 pounds at the beginning of the twentieth century (1897–1901), which declined to less than 860 pounds in the period 1902–06, and further declined to about 830 pounds in the period 1907–11, with a very slight further decline in the period 1912–16. Then came the change, indeed, the upward trend started in 1915, and was under full swing by 1918. The per capita consumption rose to an average of about 860 pounds for the period 1917–21, and then, gaining momentum, mounted to about 990 pounds for the period 1922–26. Consumption at the present time is fully 1,000 pounds per person, according to the estimates of the Bureau of Agricultural Economics. The consumption of milk per capita is now, apparently, 12 per cent greater than 25 years ago, and nearly 20 per cent greater than in the period 1912–16.

*Chickens and Eggs.*—Information on production and consumption of chickens and eggs is very unsatisfactory. The decennial census provides about all the data that exists prior to 1920. But on the basis of such information as exists, it appears that the per capita consumption of chickens for meat has declined from about 20 pounds (dressed weight) in 1899 to about 18 pounds in the period 1922–26. The lowest point, 16 pounds, was reached in 1919, and the trend since then has been slowly upward.

The changes in egg consumption have been similar, except that the per capita consumption in the last three years, 1925–27, probably has been approximately the same as at the beginning of the century. The available data indicates that consumption per capita averaged about 17.1 dozens in 1899 and 16.9 dozens in the period 1922–26, but that in 1927 it reached the highest point in the entire series of years, about 17.4 dozens. The lowest consumption occurred, apparently, in the year 1919, the same as of chickens, when a figure 15.75 dozens is indicated.

*Summary.*—The trend in per capita consumption of animal products was downward from the beginning of the century to the period just before the war (1912–16) for beef and veal, considered jointly, and also for milk, the trend was downward to the war and post-war years (1917–19) for pork and chickens, and to 1922 for mutton and lamb. Since the war the trend for milk has been upward, for pork it was upward from 1917 to 1924, for beef from 1921 to 1924, and for mutton and lamb from 1922 to 1926. At present the per capita consumption of beef and veal, considered jointly, and also of eggs, is about the same as at the beginning of the century; the consumption of mutton and lamb, considered jointly, is much less, and of chickens also; whereas the consumption of pork is now about 10 per cent greater and of milk about 12 per cent greater. It is worth noting again that the hog and the dairy cow among all farm animals produce the most human food per unit of feed consumed.

*Recent Changes.*—If this general trend during the past quarter century toward greater per capita consumption of

FIG. 14.—Between 1924 and 1926 a great increase in cotton acreage occurred, in the eastern as well as the western Cotton Belt. The net increase in acreage for the United States as a whole was as great as the net increase had been in the previous five years. However, in Georgia and South Carolina the increase was not half as great as the decrease had been in the previous five years. In 1927 the nation's acreage was much smaller, but in 1928 it rose again nearly to the 1926 level.

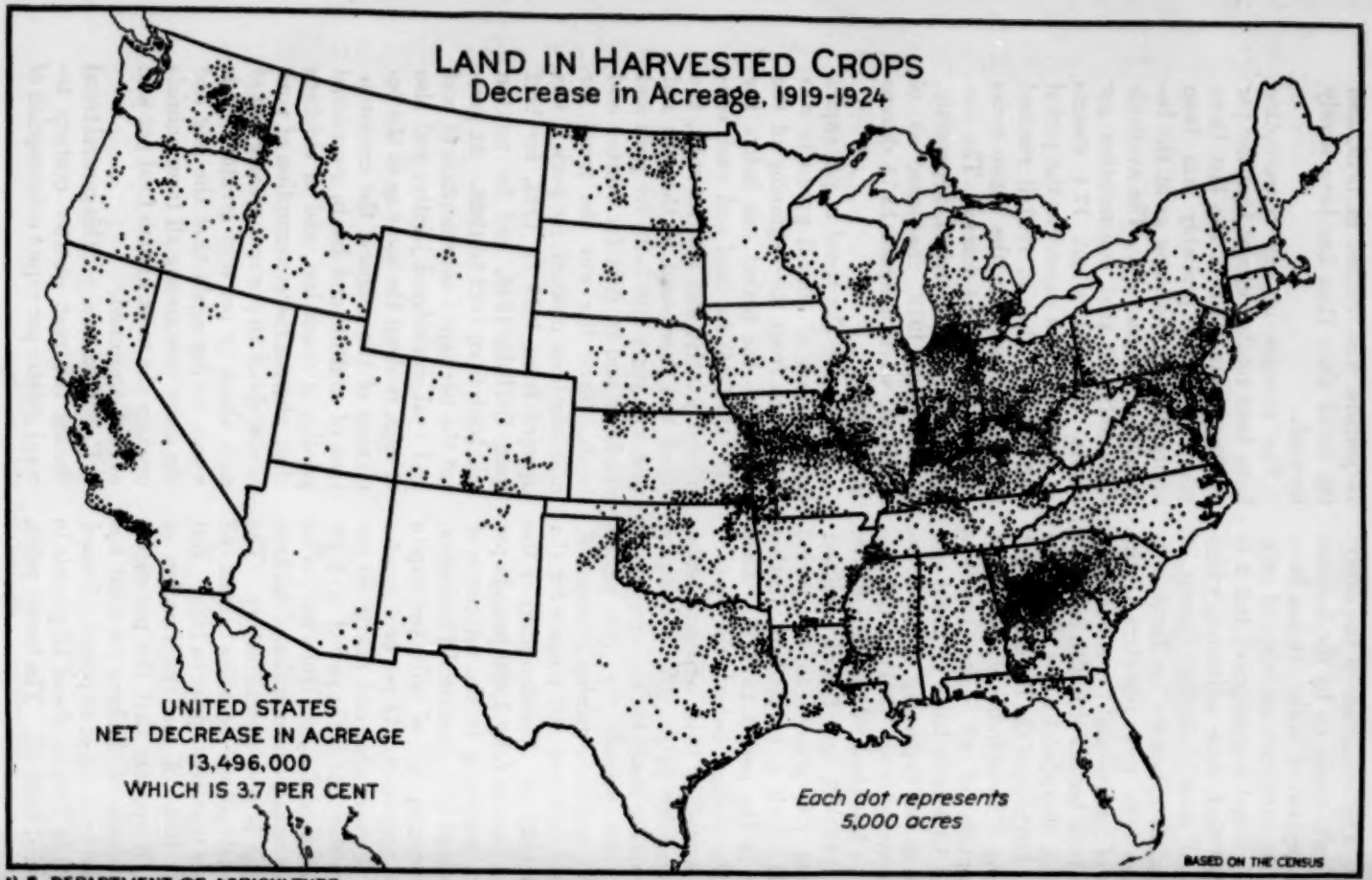


FIG. 15.—A decrease in acreage of crops occurred between 1919 and 1924 in most of the originally forested portion of the United States, and also in the valleys of California and on the plateaus of eastern Washington. The outstanding decrease was in central Georgia, and in Kentucky, Indiana, and southern Michigan, with a lesser decline in Ohio, Missouri and southern Illinois. Part of this land was used for pasture and part lay idle (*Fig. 4*). The soils in these areas are neither the worst nor the best in the United States.

milk and pork continues, with lesser consumption of mutton (including lamb) and of beef (including veal), as seems likely, less agricultural land would be needed than if the present ratios among animal foodstuffs persisted. But much more influential would be a trend toward more or toward less animal foodstuffs as a whole. The per capita consumption of total meat, excluding poultry, shows a downward trend since 1924, the estimate for 1927 being 10 pounds less than for 1924, or 7 per cent. But the per capita consumption of milk is still increasing,—it was fully 2 per cent higher, apparently, in 1927 than in 1924. The decline in per capita consumption of meat was owing to a decline in pork and lard consumption in 1925 and 1926, and to a decline in beef and veal consumption in 1927, but it is too soon to determine whether this trend is transitory or permanent. If it should prove permanent, it would result in a lesser need for agricultural land, because animal food stuffs require a much greater acreage for the production of equal calory value than do plant foodstuffs.

### CHANGES IN CONSUMPTION OF AGRICULTURAL PRODUCTS OTHER THAN FOR FOOD OR FEED

*Cotton.*—The per capita consumption in the United States of cotton lint, excluding linters, has remained remarkably uniform at between 25 and 30 pounds during most of the years since 1900. The average for the five years, September 1, 1897 to August 31, 1902, however, was only a little over 23 pounds, while for 1902–07 and also for 1907–12 it was about 25 pounds, for 1912–17 it was nearly 30 pounds, and for 1917–22, also for 1922–27, the average was about 27 pounds. No other major crop has had so uniform per capita consumption for so long a time. This is the more remarkable in view of the great fluctuations that have occurred in acreage, production and price. However, cotton acreage during the first quarter of the twentieth century increased over 60 per cent, while the population of the nation increased only about 50 per cent. This increase in per capita acreage, necessitated largely by the ravages of boll weevil, has occurred despite a decrease in proportion of the crop exported from two-thirds to one-half.

*Wool.*—The total production of wool in the United States has remained remarkably constant during the past quarter century. The per capita consumption of wool also remained almost constant until the World War, the increase in population being met by increasing imports. Unlike cotton, of which a half or more of the crop is exported, the consumption of wool in the United States is largely dependent on imports. During the World War consumption per capita rose 10 per cent. Since the war the per capita consumption has fallen not only to the pre-war level, but even over 10 per cent below the average at the beginning of the century (1898–1902). This much greater decline in per capita consumption of wool than of cotton since the war, and a notable decline also since the beginning of the century as contrasted with an increase for cotton, indicates that the increasing use of silk and rayon has affected the consumption of wool more than that of cotton.

*Flaxseed.*—The principal product made from the flax crop in the United States is linseed oil, which is used in the manufacture of paint, linoleum and other products. The production of flaxseed in the United States, like that of wool, shows no increase during the past quarter century, the highest production for a series of years being attained from 1902 to 1908 inclusive. The supply needed by the increasing

valleys of California and on the plateaus of eastern Washington. The outstanding decrease was in central Georgia, and in Kentucky, Indiana, and southern Michigan, with a lesser decline in Ohio, Missouri and southern Illinois. Part of this land was used for pasture and part lay idle (Fig. 4). The soils in these areas are neither the worst nor the best in the United States.

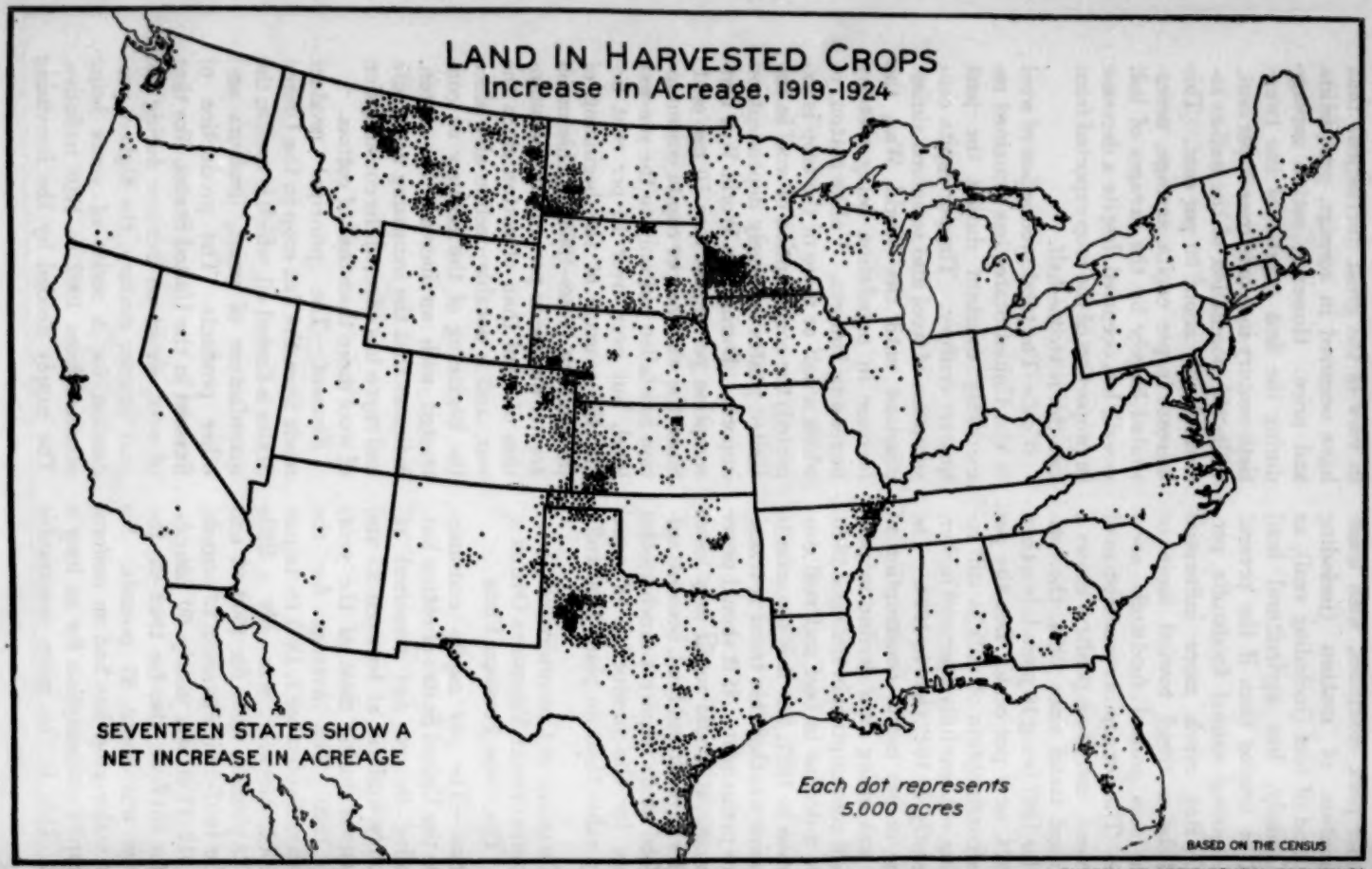
LAND IN HARVESTED CROPS
Increase in Acreage, 1919-1924
SEVENTEEN STATES SHOW A NET INCREASE IN ACREAGE
Each dot represents 5,000 acres
BASED ON THE CENSUS
U.S. DEPARTMENT OF AGRICULTURE
BUREAU OF AGRICULTURAL ECONOMICS

FIG. 16.—The increase in crops harvested between 1919 and 1924 was almost confined to the Great Plains Region, which is well adapted to the use of large-scale machinery, and to southern Minnesota, with a few counties showing an increase in the Upper Lakes country, southern New England, southern Georgia, Florida, and the upper end of the Mississippi Delta. In the Dakotas and Montana the increase indicated is misleading, as 1919 was a year of unprecedented drought and only a part of the crop was harvested.

population has, therefore, been obtained by importation. Fully half is now imported. The per capita consumption of linseed oil rose from less than 4 pounds in 1897–1902 to over 5 pounds in 1902–07, then remained at about 5 pounds until 1922, when it rose to nearly 6½ pounds and has remained at this higher level since.

*Tobacco.*—Like cotton, and unlike wool and flaxseed, the United States produces a large surplus of tobacco above domestic consumption. The net exports were nearly one-half of the production at the beginning of the century and are now one-third. The per capita consumption has risen during the quarter century from about 5.8 pounds to 7.3 pounds, or fully a fourth. The increase in acreage has been 70 per cent, while the increase in the nation's population has been only about 50 per cent.

*Summary.*—The per capita consumption of cotton has remained more or less uniform for a quarter century, but of wool is much lower since the war; the per capita consumption of flaxseed and of tobacco, on the other hand, has increased since the World War. Totaling these four major agricultural products not used for food or feed on the basis of average farm price during the decade 1917–26, and including also several minor products of this class, it appears that the average per capita consumption of these products used mainly for industrial purposes was greatest in the period 1912–16, but was nearly 10 per cent higher during the past decade than at the beginning of the century.

### CHANGES IN AGGREGATE PER CAPITA CONSUMPTION OF PLANT FOODSTUFFS, ANIMAL FOODSTUFFS AND OTHER AGRICULTURAL PRODUCTS

Combining the various plant foodstuffs on the basis of average farm price 1917–26, it appears that aggregate per capita consumption was over 5 per cent greater in the period 1902–06 than in the base period 1897–1901, and reached a level almost as high in 1912–16, whereas consumption in the period 1917–21 was over 2 per cent below the 1897–1901 level. It then rose to over 3 per cent above this level in the period 1922–26. This rise of nearly 6 per cent is owing largely to the increasing consumption of fruits, vegetables and sugar, which have a much higher farm value per unit than the cereal foodstuffs they have partially replaced. Animal foodstuffs, on the other hand, reached their lowest level in the period 1912–16, and consumption was only slightly greater in the next five-year period, 1917–21. But during the years of urban prosperity beginning with 1922 consumption rose to a level over 5 per cent higher than in 1897–1901 and over 10 per cent higher than in 1917–21. Consumption of animal foodstuffs for several years has exceeded the level at the beginning of the century.

This increase in consumption of animal foodstuffs, which require so much more land and labor to produce equal energy values than do the plant foodstuffs, probably helped greatly to alleviate the agricultural depression of the past eight years. The decrease in crop acreage would necessarily have been much greater, and, undoubtedly, the prices of agricultural products would have been much lower, had not this shift in diet occurred.

The diet of the period 1922–26, it will be noted, was much more expensive in character than in any previous period since the beginning of the century; indeed, it was probably more expensive than in any previous period in the nation's history.[13] The increase

[13] By *more expensive* is meant a shift from less costly toward more costly foods, but owing to increasing efficiency in agriculture, less labor was required in recent years than formerly. More power, however, was required and probably more movable capital.

large-scale machinery, and to southern Minnesota, with a few counties showing an increase in the Upper Lakes country, southern New England, southern Georgia, Florida, and the upper end of the Mississippi Delta. In the Dakotas and Montana the increase indicated is misleading, as 1919 was a year of unprecedented drought and only a part of the crop was harvested.

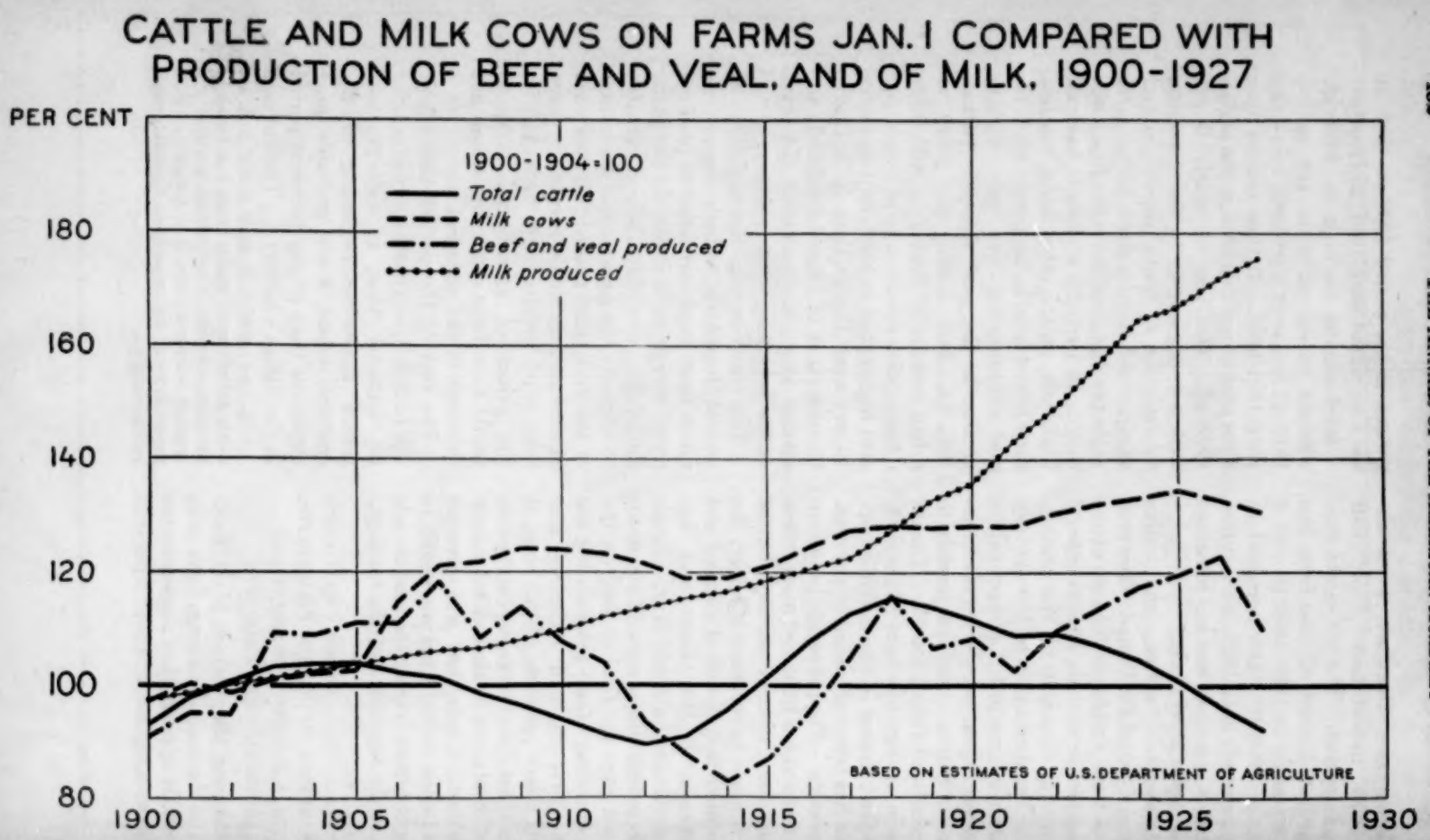


FIG. 17.—Two cycles of number of cattle and of production of beef are incompletely shown. The first cycle in number of animals began probably about 1896 and ended in 1912, and the second cycle is probably just over (1929). The first cycle of beef production began in 1898 and ended in 1914, and the second cycle probably has a couple of years yet to run. With milk production, there is no evidence of a cycle, but, instead, there is a constantly rising production, which since 1918 has been increasing much more rapidly than number of milk cows.

over the preceding five-year period, 1917–21, in normal farm value of the products consumed per person was nearly 10 per cent, but over that of 1902–06, less than 4 per cent.

The importance of this more expensive diet in mitigating the agricultural depression will be better realized when it is noted that foodstuffs constitute about seven-eighths of the total consumption of agricultural products. If the prosperity of the non-farm people, who now constitute three-fourths of the nation's population, should decline, and the per capita consumption of agricultural commodities gradually return to the former proportions, that is, if a reverse trend toward less meat and milk and more cereal foods set in, the reaction on agriculture would become increasingly serious.

However, the increasing consumption of sugar, which is mostly imported from Cuba and our insular possessions, has been an aggravating factor in the agricultural depression, and has doubtless contributed to the decline in consumption of wheat especially.

The present relative prosperity of the dairy industry, despite a greater increase in production of milk and its products than has occurred in any other major class of foodstuffs, suggests, however, that efforts to encourage the consumption of other animal products also would be worth while. It is certain that no change in diet would be of benefit to so large a proportion of the farmers of the United States as a further increase in the consumption of animal products.

## THE TREND IN POPULATION

Having briefly considered the changes in agricultural production and per capita consumption, there remains to be noted the third group of factors that are fundamental to an understanding of the agricultural situation and in estimating the need for more crop land, namely, those relating to population.

However great the increase in agricultural production, however great the changes in diet, if population continues to increase it must sooner or later press with increasing severity upon the limitations of the land. This fact which Malthus pointed out over a century ago, and which he showed was characteristic of the history of almost all civilizations, colored the conclusions of the writer until two or three years ago, not only with reference to the Orient and Europe but with reference to the United States also, and it appears to color the thoughts of nearly all others interested in the relationship of land to population even today.

But during the past few years evidence has been accumulating that both the United States and the countries of northwestern Europe are rapidly approaching a stationary population.[14]

[14] Relative to Europe, the declining birth rates prior to the World War were summarized by W. Russell Taylor in his doctor's thesis, "The Natural Increase of Contemporary Peoples," the University of Wisconsin, 1923, which the writer read in manuscript; but it was not until the publication of Robert R. Kuczinski's article, "The World's Population," in the October, 1928, issue of *Foreign Affairs* that it was realized how rapid the decline in birth rates since the war had been in northwestern Europe. Kuczinski shows in this article, and more fully in his book, "Balance of Births and Deaths, Western and Northern Europe," Vol. 1, which has since been published, that for all the countries of northwestern Europe, from Sweden to Scotland and south to France, Switzerland and Austria, the birth rate, even if it declines no farther, is scarcely sufficient to balance the death rate that will develop if the present birth rate persists. The birth rate in England and in Germany is now lower than in France, where population is stationary, but owing to the lower death rate in England and Germany, where sanitary conditions are better, and also where there are more young people and fewer old people than in France, the population is still increasing. This increase, however, unless the birth rate advances again, cannot continue much longer than one generation, and may not continue so long.

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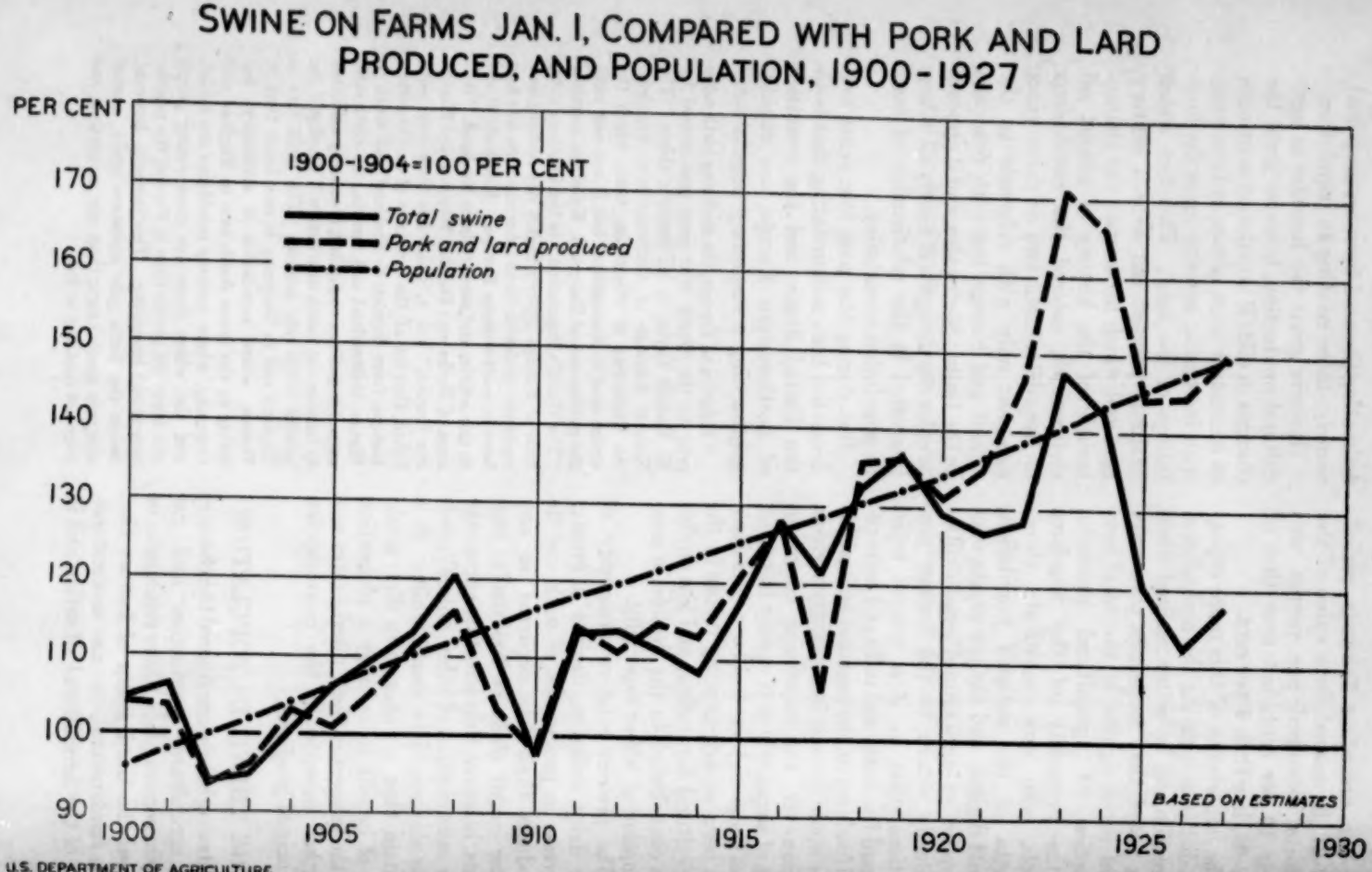


FIG. 18.—The production of pork and lard shows no deviation in trend from the number of hogs on farms from 1900 to 1920, that is, production per head on farms January 1, remained practically constant. Then the two lines began to diverge, and by 1923 production of pork and lard per hog on farms was 15 per cent greater than in 1920, and by 1926 it was 28 per cent greater. The production of pork and lard per person during the past decade has averaged greater than 20 years ago.

First Pearl and Reed, in 1921, applied the logistic curve to the census data on the population of the United States since 1790, and reached the conclusion that the increase of population would soon begin to taper off, the rate of increase becoming progressively less until a practically stationary population was attained about the year 2020.[15] These figures suggested that the population in the United States would not attain the high ratio to agricultural resources which exists in western Europe; nevertheless, that much more crop land would be needed to feed and clothe the 100 million more people in the United States 100 years hence.

Then came the work of Dublin and Lotka, statisticians of the Metropolitan Life Insurance Company, who showed that after the present natural increase rate in the United States (excess of births over deaths) is corrected for the larger proportion of young people in the population at present than there will be in the future, resulting from the fact that the birth rate, both rural and urban, is falling, and that the large number of immigrants till recently were mostly young people, also because of the decreasing proportion of the population which is rural (whose birth rate is greater than that of the urban population), this natural increase rate would be reduced to one-half the 1920 rate, or to about 5.5 per thousand population.[16] When these corrections were made, the birth rate in 1920 would be reduced from 23.4 to 20.9 per thousand population, and the death rate would be raised from 11.0 to 15.4 per thousand. It is significant that the decline in the birth rate since 1920 has been so rapid that it is now (1927) only 20.4. A rise in the death rate may be expected soon. This will not mean that the average life of people will be shorter, but merely that the young people will be growing older and will not be replaced by as large a proportionate number of young people as in the past.

The latest study in this field of predicting the population of the United States is that by Whelpton of the Scripps Foundation for Population Research in Miami University.[17] This study starts with the census population of 1920, corrected for the under-enumeration of children under five years of age, and applies to this base the trend of death rates and birth rates in the Registration Area for rural and urban by color and age groups. The death rates in two low death-rate countries, Australia and New Zealand, are also considered on the assumption that a situation as favorable as that in New Zealand would be reached in the United States in 50 years. Future immigration was assumed to be 1,000,000 every 5 years, which is similar to that at present, and migration from farms to cities was also taken into account, because of the great difference in birth rates in these environments. The resulting estimate is 175 million population in the year 1975 and about 186 million in the year 2000 A.D. These figures are practically the same as those of Pearl and Reed, which were based merely on a mathematical projection of the trend of population since 1790.

A startling confirmation of these statistical estimates came to the writer's attention only the past month (November, 1928). In a daily paper

[15] "Forecasting the Growth of Nations," by Raymond Pearl and F. C. Kelley, *Harper's Magazine*, May, 1921.

[16] "The Statistician and the Population Problem," by Louis I. Dublin, *Journal of the American Statistical Association*, March, 1925.

"Of the True Rate of Natural Increase," by Louis I. Dublin and Alfred I. Lotka, *Journal of the American Statistical Association*, September, 1925.

[17] "Population of the United States, 1925–1975," by P. K. Whelpton, *American Journal of Sociology*, September, 1928.

FIG. 18.—The production of pork and lard shows no deviation in trend from the number of hogs on farms from 1000 to 1980, that is, production per head on farms January 1, remained practically constant. Then the two lines began to diverge, and by 1928 production of pork and lard per hog on farms was 15 per cent greater than in 1980, and by 1980 it was 95 per cent greater. The production of pork and lard per person during the past decade has averaged greater than 20 years ago.

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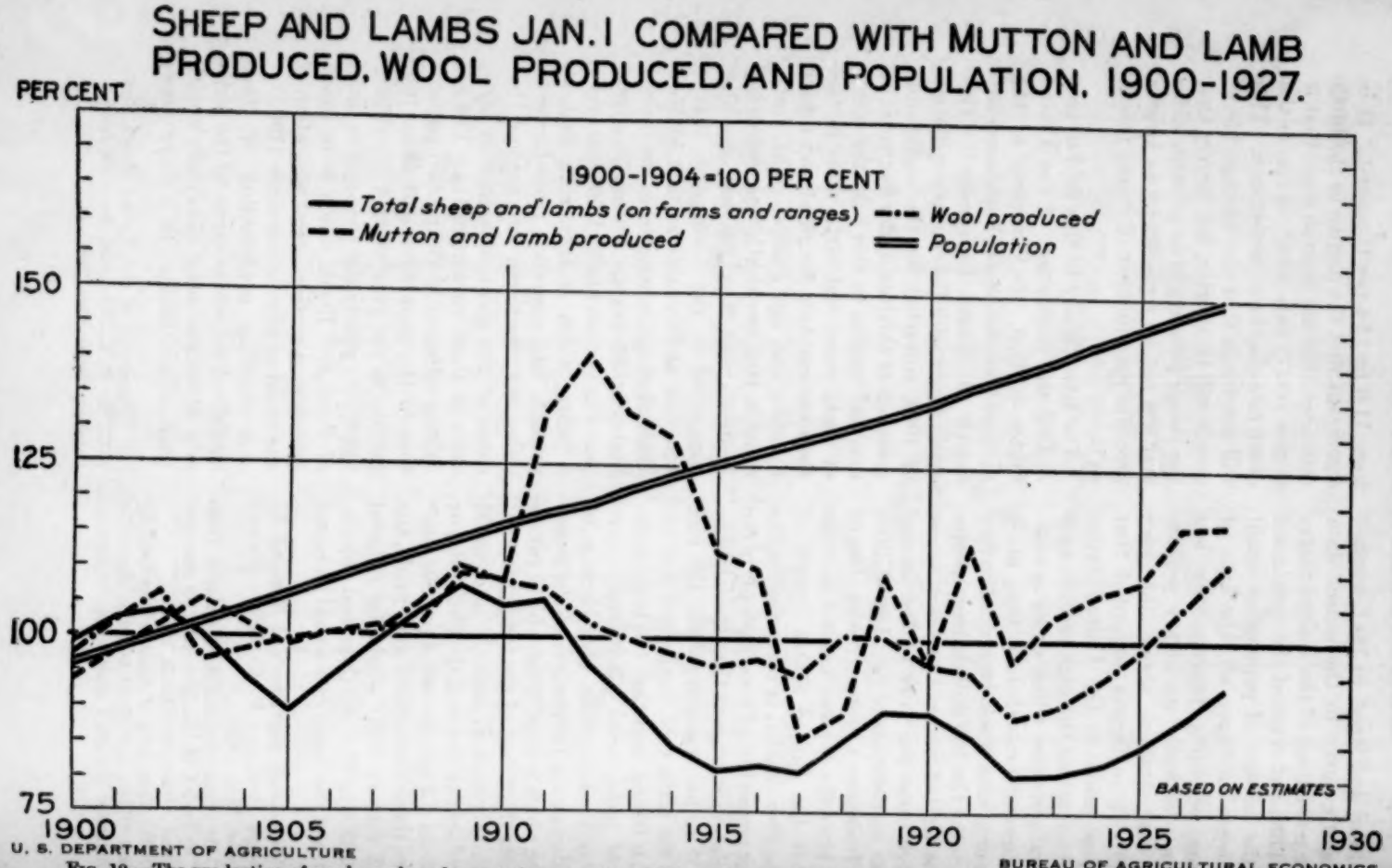


FIG. 19.—The production of wool per sheep began to increase about 1912 and has remained since 1913 from 7 to 15 per cent higher than at the beginning of the century. The production of mutton and lamb, considered jointly, per sheep on farms and ranges began to increase about 1911 and remained very high for several years, largely at the expense of the breeding stock. Since 1917 the trend in production of lambs and mutton has been upward and at a more rapid rate than the increase in sheep and lambs on farms and ranges January 1.

BUREAU OF AGRICULTURAL ECONOMICS

he noted a news release relating to a bulletin of the United States Bureau of Education on enrollment in the public schools. Upon procuring a copy of this bulletin he was amazed to learn that the enrollment in the first grade had been decreasing since 1918, or for nearly a decade.[18] Much of this decrease is to be assigned to more rapid promotion, but it is the opinion of Dr. Phillips, of the Bureau of Education, that the number of children six years old is no greater now than in 1920. In a recent paper he estimates the number of six-year-old children as shown in the table below, to which may be added the statistics of enrollment in the first, second and third grades, and also in the eighth, ninth and twelfth grades, the latter as evidence of increasing prosperity and interest in education, which is very likely, in turn, to affect the birth rate.[19]

decreasing since 1918, in the second grade the decrease did not set in until 1923, and in the third grade not until 1925. This fact is doubtless in part assignable to the recent more rapid promotion, previously mentioned. The influenza epidemic of 1918 and war conditions are reflected in the low birth rate in 1919 (see Fig. 22), and in the drop in six-year-old children in 1925; but the rapid decline in the birth rate in 1922, and again in 1925 and 1926, has not yet had time to be reflected in the school enrollment figures.

Mr. Phillips associates the declining birth rate in the United States, and approximately stationary number of children six years old, with the increasing prosperity and per capita wealth. In the paper previously referred to he includes two graphs, which he has given permission to reproduce, one showing the birth rate in the registration area

ESTIMATED NUMBER OF CHILDREN SIX YEARS OLD, AND ENROLLMENT IN FIRST, SECOND AND THIRD, EIGHTH, NINTH AND TWELFTH GRADES OF PUBLIC SCHOOLS, UNITED STATES, 1917–28

| Year | Estimated Number of Six-Year-Olds | Enrollment in Grades (Elementary) | | | | (High School) | |
|---|---|---|---|---|---|---|---|
| | | First | Second | Third | Eighth | Ninth | Twelfth |
| 1917 | 2,245,971 | 4,224,907 | 2,600,418 | 2,503,813 | 1,218,915 | 743,064 | 251,259 |
| 1918 | 2,276,419 | 4,323,170 | 2,607,727 | 2,524,215 | 1,140,804 | 816,396 | 268,917 |
| 1919 | 2,306,867 | 4,321,996 | 2,622,775 | 2,510,915 | 1,194,566 | 866,519 | 290,236 |
| 1920 | 2,338,315 | 4,320,823 | 2,637,822 | 2,497,615 | 1,248,328 | 916,642 | 311,555 |
| 1921 | 2,255,335 | 4,248,745 | 2,743,417 | 2,606,922 | 1,346,007 | 1,065,177 | 336,878 |
| 1922 | 2,283,421 | 4,176,667 | 2,849,013 | 2,716,229 | 1,443,685 | 1,213,713 | 362,201 |
| 1923 | 2,302,955 | 4,180,450 | 2,831,210 | 2,755,947 | 1,411,689 | 1,271,062 | 426,179 |
| 1924 | 2,307,329 | 4,184,232 | 2,813,409 | 2,795,665 | 1,379,692 | 1,328,412 | 490,158 |
| 1925 | 2,154,235 | 4,048,808 | 2,799,520 | 2,730,383 | 1,492,843 | 1,424,304 | 540,516 |
| 1926 | 2,322,448 | 3,976,750 | 2,819,896 | 2,729,252 | 1,488,104 | 1,425,204 | 591,505 |

It will be noted that although the enrollment in the first grade has been annually since 1915, and the other the states arrayed with reference to birth rate in 1927, with corresponding curve of per capita wealth, according to the census estimate for 1925 (Figures 22 and 23). The inverse correlation is striking, but lest the relationship be accepted as conclusive, it appears well

[18] "Statistical Survey of Education, 1925–26," by Frank M. Phillips, United States Bureau of Education, Bulletin No. 12, 1928.

[19] "Prosperity, Population and Public Education," by Frank M. Phillips, *American School Board Journal*, October, 1928, supplemented by a table supplied by Mr. Phillips.

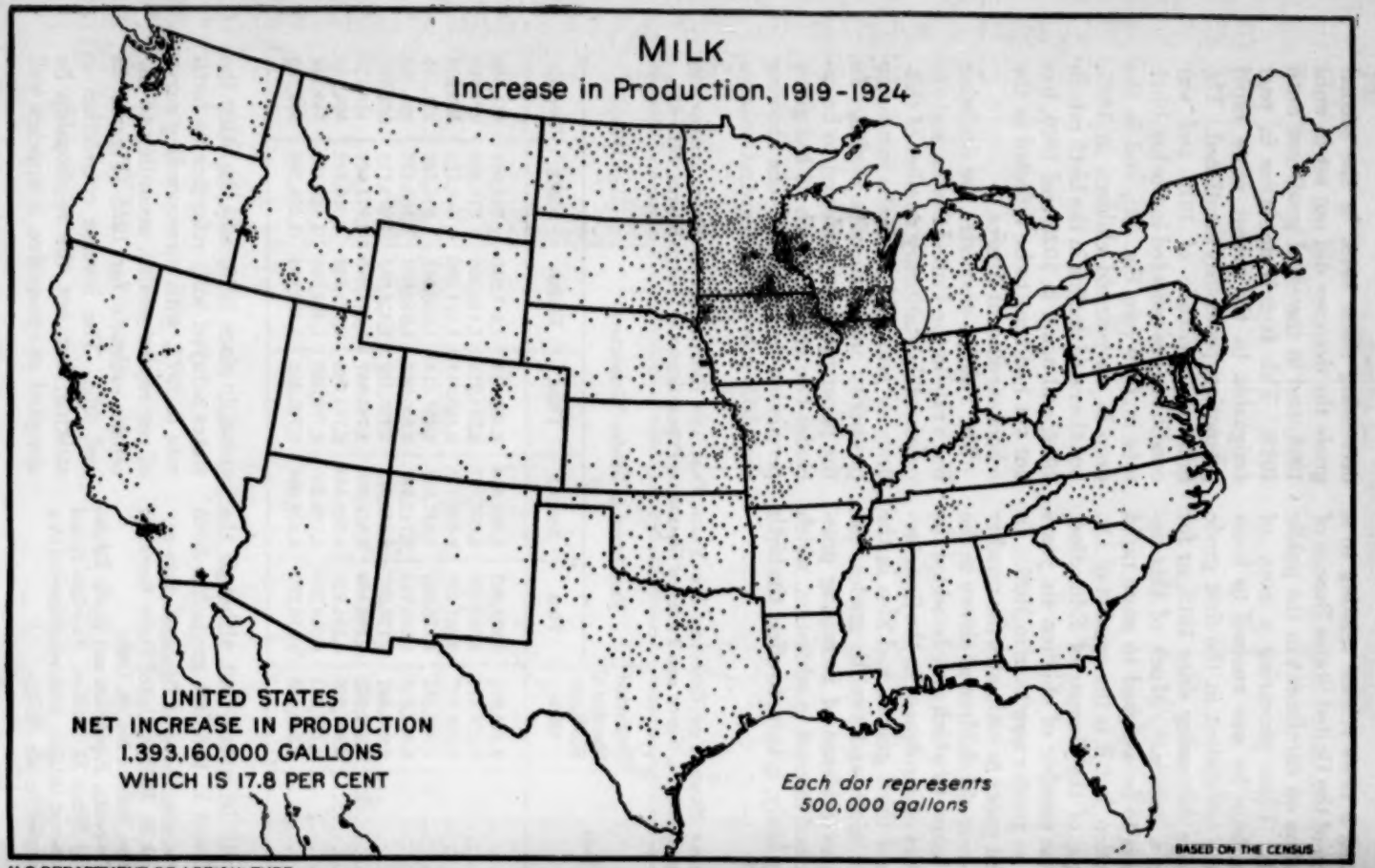


FIG. 20.—The increase of milk production in the United States between 1919 and 1924 was almost universal, but the increase in the region lying between Lake Michigan and the semi-arid plains was much greater than elsewhere. For these six States the production of milk, according to the census, was 32 per cent greater in 1924 than in 1919, but the production of butter was 56 per cent greater, according to reports made to the United States Department of Agriculture.

1,400,000 CALORIES OF THE FOLLOWING FOODS

Lake Michigan and the semi-arid plains was much greater than elsewhere. For these six States the production of milk, according to the census, was 92 per cent greater in 1924 than in 1919, but the production of butter was 56 per cent greater, according to reports made to the United States Department of Agriculture.

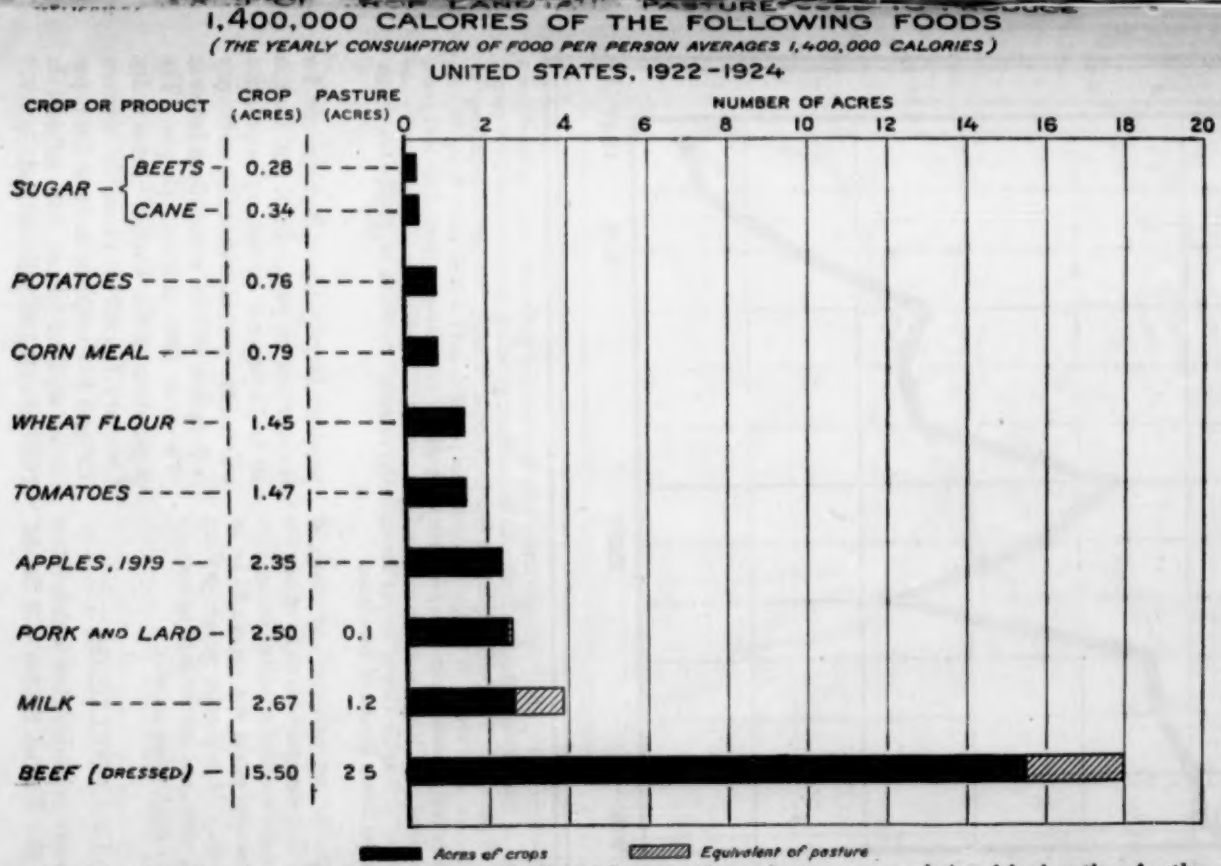


FIG. 21.—One-third of an acre in sugar crops in the United States produces about as many calories of food as three-fourths acre of potatoes or corn, or one and a half acres of wheat or tomatoes. But, of course, lacking protein and fat, a person could not live on sugar alone, and the cereal diet would maintain health much longer. But to maintain health permanently meat, milk, or other foods high in protein and fat should be added, and these require about two and a half acres of crops to produce the same energy value in pork and milk, or 15 acres devoted to beef production. These meat figures are based on cost of production records in the Corn Belt and the milk figures on similar records for 50 farms in Wisconsin.



to quote the final paragraph from Mr. Phillips' article:

> The fact that the birth rate has been on the decline, while per capita wealth has been increasing, does not of itself indicate any close degree of correlation. A study of the individual states shows that those with a low birth rate generally have a high per capita wealth, and vice versa. It is a mistake to charge the high birth rate of the South to the colored race, because the rate for the two groups is very much alike. If birth rates for white people only are used,

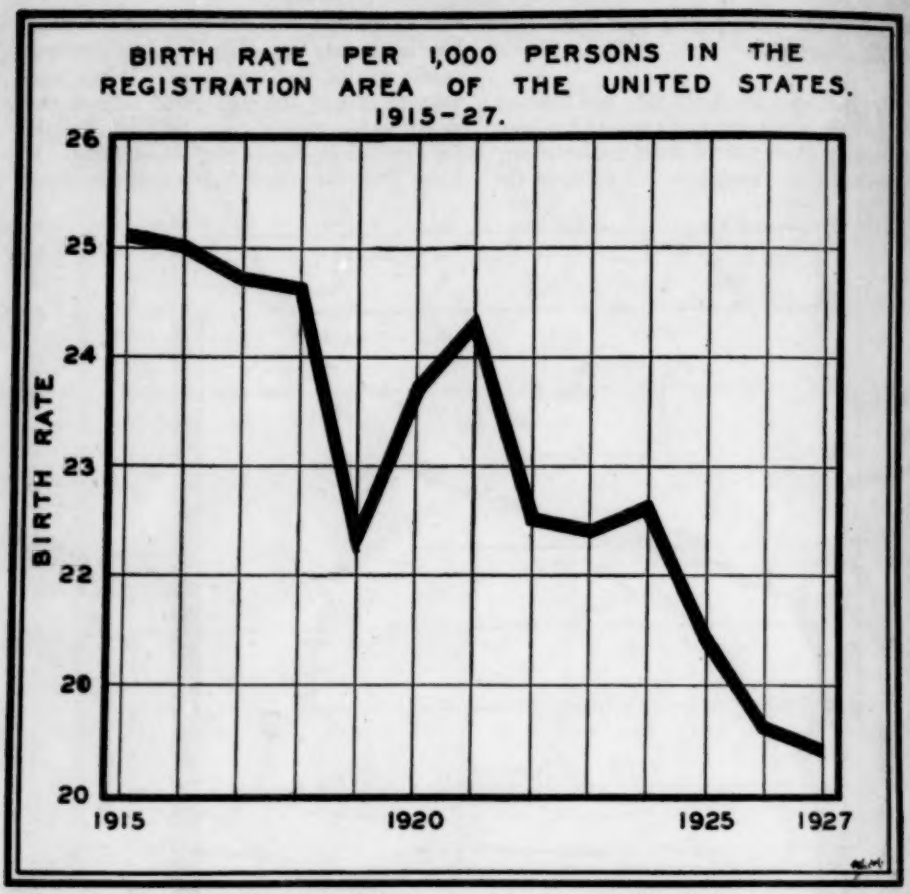


FIG. 22.—Since 1915, when the registration area first became sufficiently large to constitute a fair sample of the United States, the birth rate has declined by nearly five births per 1,000 people, or about 20 per cent. The decline has been especially rapid (totaling four per thousand) and almost continuous since 1921. A further decline of four per thousand (to 16.4) would bring the birth rate down to that necessary merely to maintain a population whose average span of life is 61 years, which is several years longer than the average life at present. The diagram is reproduced by permission from "A Graphic View of Recent Trends in Our Schools," by Frank M. Phillips, statistician of the United States Bureau of Education.

the results do not undergo any material change. If it were possible to have a figure for per capita wealth for white people only, the relationship might not appear to be so well defined. At any rate, we are getting wealthier, wiser, and less inclined to keep up the rate of population growth.

## IN CONCLUSION

It appears probable that within a few decades the United States will be dependent largely upon immigration for its increase in population, and that in 50 to 75 years a stationary population will be attained, also that this stationary population will be somewhere between 175 and 200 million people. The population of the United States today (January 1, 1929) is probably between 120 and 121 million; in 1940 the population will be about 138 million, in 1950 about 152 million and in 1975

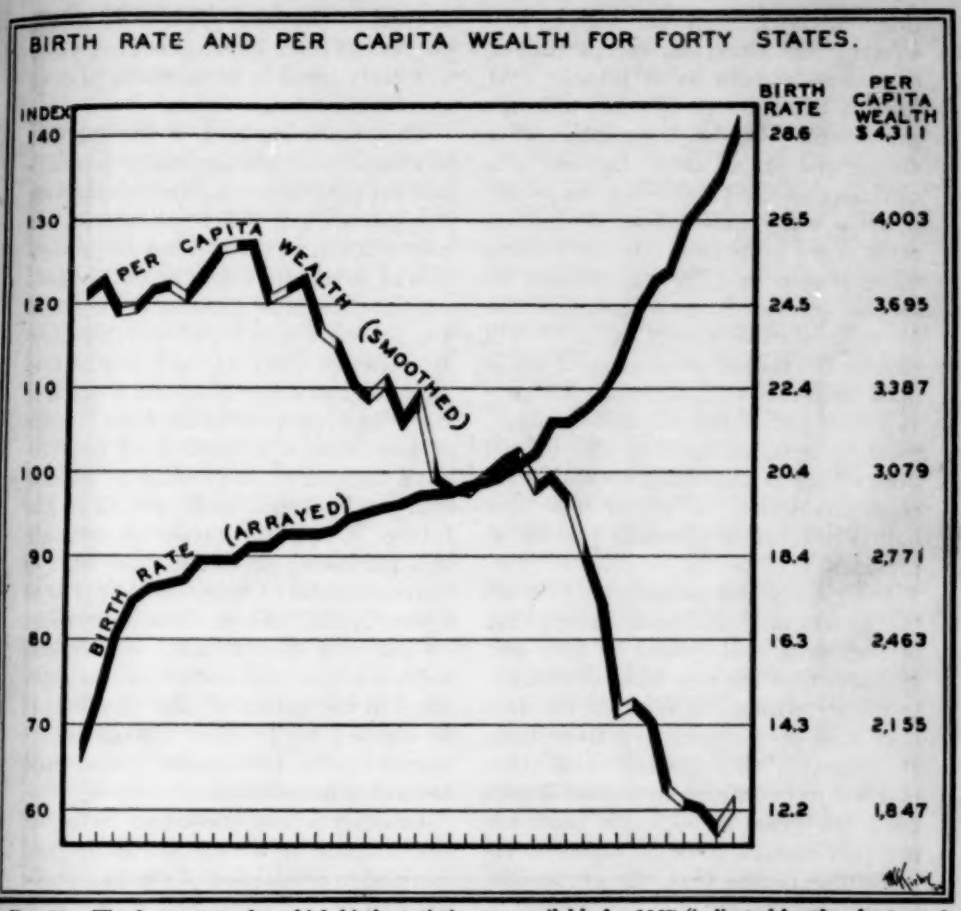


FIG. 23.—The forty states for which birth statistics are available for 1927 (indicated by the short erect lines along the base line) have been arranged according to an ascending birth rate, and then the per capita wealth of each state in 1925 is plotted directly above or below the points indicating the birth rate. It is evident that in those states where the per capita wealth is larger than the average for the United States the birth rate is lower, and that where the per capita wealth is smaller the birth rate is higher. The diagram is from "A Graphic View of Recent Trends in Our Schools," by Frank M. Phillips, statistician of the United States Bureau of Education.

about 175 million. How much more agricultural land are we likely to need to meet the needs of these added millions? This can be estimated for the next decade, but beyond this period prediction becomes hazardous, particularly because of the uncertainty as to exports and imports.

Let us assume first that our present diet, very high in animal products, fruits, vegetables and sugar, will continue; that no further progress will be made in substitution of tractors and automobiles for horses and mules, nor in production of meat and milk per unit of feed consumed, nor in crop yields per acre, nor will any shifts occur between the less productive and more productive crops and classes of farm animals; finally, that agricultural exports and imports will increase proportionally to the increase in popula-

tion—in brief, that all the factors affecting the situation, except that of crop area, remain as at present. At present there are three acres of crops per person. On the assumption of a status quo for all other factors, it is obvious that the 17 million more people in 1940 will require about 50 million acres more crop land, the 30 million more people in 1950 will require 90 million acres more crop land, and the 53 million more people in 1975 will require 160 million more acres of crops. Such amounts of land could be provided for out of the 975 million acres, more or less, of land in the United States that is physically available for crop production, of which less than half is in crops or plowable pasture at present.

But clearly this assumption that all the factors of production, except that of crop area, will remain as they are, and also that the diet will not change, is wholly wrong—in spite of the fact that most people assume it to be true. It is certain that tractors and automobiles will continue to replace horses for a few years at least, for there are not half enough colts on farms to replace the horses that die or become useless each year.

### THE NEED FOR LAND TEN YEARS HENCE

If this substitution of tractors, trucks and automobiles for horses and mules continues for another decade at the same rate as during the past decade, about 15 million more acres of crops will be released to feed meat and milk animals. This replacement of horses and mules by tractors may be more or less rapid than during the past decade, but it is unlikely that less than 10, nor more than 20 million acres of crops will be released for meat and milk animals, which is an increase of between 6 and 12 per cent in the acreage so used at present. This is 50 to 100 per cent as great increase as that which will likely occur in population. Let us assume the smaller figure.

The remaining half of the increase in animal products necessary to maintain the present per capita consumption it appears likely will be provided by a continuation of the increase in production of meat and milk per unit of feed consumed. This amounted to about 1½ per cent a year between the five-year period 1917–21 and the period 1922–26, but as the geographic shifts in cattle and hog production from regions of less efficient utilization of feed toward regions of more efficient utilization probably will be less rapid in the future, it appears unsafe to estimate this increasing production per unit of feed consumed at more than 1 per cent a year during the next decade, or about 10 per cent gain in all. This would mean a saving of about 18 million more acres in the extent of land that would be needed to produce the crops required by the nation's meat and milk animals a decade hence.

In other words, these two factors of the decrease in horses and mules and increase in production of meat and milk per unit of feed consumed appear sufficient to supply the 15 million more people a decade hence with the present per capita consumption of animal products without any increase in total acreage of crops fed to livestock. This is probably true also of pasture land, for although there are no data on the acreage of pasture required to feed horses and mules, it appears probable that pasturage is being released by the decline in horses and mules at much the same rate as crop land.

This conclusion with regard to the next decade involves no change in acre-yields of the feed crops, which constitute about 70 per cent of the total crop acreage. It is not unlikely that with

the spread of the corn borer the acre-yields of corn for grain will decline somewhat, but it also appears likely that the increasing use of the entire corn plant for silage and fodder will partly, perhaps fully, balance this decrease in grain-yield. It also seems likely that with the increasing use of fertilizers the acre-yields of oats and barley will slowly rise, while the trend from non-leguminous toward leguminous hays, notably alfalfa, will result not only in a greater acre-yield of the hay crop, but in a still greater feed-yield (since leguminous hays are fully 50 per cent more nutritious than other hays). It appears probable, therefore, that the production of feed per acre will increase rather than decrease during the next decade.

With reference to plant foodstuffs the situation is less clear. In view of the probable further expansion of both wheat and rye production along the semi-arid margin of the Great Plains, it is unlikely that the acre-yields of these crops for the nation as a whole will increase, and they may decrease. In other words, an increase in acreage fully equal to the increase in population appears likely, provided no change occurs in the proportion of these crops exported. If, on the other hand, to make an extreme assumption, the exports of these grains should decrease 6 per cent a year on the average, as they did between the periods 1919–23 and 1924–28, it would provide more wheat and rye than would be needed by the 15 million more people in 1940 than in 1930. The acreage of these bread grains 10 years hence is almost certain to fall between these limits, and will probably be as near the latter (2 million acres decrease) as the former (7 million acres increase). Moreover, any increase that may occur in the per capita consumption of fruits and vegetables, if it involves a decrease in consumption of other foodstuffs, will result in a decrease in crop acreage, since fruits and vegetables have very high yields per acre. For plant foodstuffs as a whole it appears that if the nation continues to export the present quantity of wheat and rye, the increase in acreage is likely to be about as rapid as the increase in population, which is estimated at 12 per cent; but if exports of these grains continue to decline at the same rate as during the past decade, no increase, but rather a contraction in the acreage devoted to plant foodstuffs is indicated. It is very probable that in 1940 the acreage producing plant foodstuffs will be somewhere between 3 million acres less and 8 million acres more than at present.

For the crops other than those grown for feed or food, principally cotton, flax and tobacco, the prospect is still more uncertain. Cotton acreage has fluctuated wildly since the war, and even if the five-year periods 1919–23 and 1924–28 be compared, the acreage increased nearly 30 per cent and production over 40 per cent. Likewise with flax, comparing the two five-year periods, acreage increased 100 per cent and production 122 per cent. For tobacco, on the contrary, there was a decrease in acreage of 3 per cent and in production of 5 per cent. For the three crops the increase in area was over 10 million acres, or 6 per cent a year on the average. It is very unlikely that such a rate of increase will persist through the coming decade, but if it should there will be nearly 30 million more acres devoted to these three crops than at present. On the other hand, it is as likely that the acreage devoted to these crops will be no greater then than now. To split the difference and allow 15 million acres increase for these three crops is probably as good a guess as can be made.

If the acreage devoted to producing feed remains stationary, while that de-

voted to food production increases about 3 million acres, and that devoted to other crops becomes 15 million acres greater, we reach the conclusion that there will be probably 15 to 20 million more acres in crops a decade hence than at present. This is an increase of 4 to 6 per cent, as compared with a practically stationary acreage during the past decade. Where will these 15 to 20 million acres of land be found?

In 1924, according to the census, there were about 34 million acres of "crop land lying idle or fallow," of which fully 25 million were lying idle. The estimates of the Bureau of Agricultural Economics indicate that there were about 10 million more acres in harvested crops in 1928 than in 1924 (thus balancing the decrease between 1919 and 1924). Part of this increase came from this idle crop land, part from plowable pasture, and a smaller part from clearing of forest land. It is evident, therefore, that there remains enough idle crop land in farms to provide for nearly all the probable increase in crop acreage by 1939, and, in addition, there are over 100 million acres of plowable pasture in farms, not to speak of the large areas in farms that may be utilized for crops by clearing or draining the land. Certainly there will be no need to expand the net farm area of the nation during the next decade.

But just as certainly there will be expansion in some regions and contraction in other regions. Between 1920 and 1925 the number of farms decreased 329,404 in 1,649 counties and increased 252,770 in 1,383 counties; while the area of crop land harvested decreased 28,658,000 acres in 2,091 counties and increased 15,962,000 acres in 950 counties (Figs. 15 and 16). This decrease in crop acreage harvested occurred mostly in the counties having low land values, as is shown in the table below.

It seems reasonable to expect that this trend toward the less intensive utilization of the less fertile, less smooth, or less favorably located land will continue during the next decade; and, furthermore, that a trend may set in toward the more intensive utilization of the more fertile, smooth, or favorably located land. In addition to an increasing production per animal and per unit of feed consumed, there may

DECREASE IN CROP ACREAGE HARVESTED, 1919–24, TABULATED BY COUNTIES ACCORDING TO AVERAGE VALUE OF FARM LAND PER ACRE, JANUARY 1, 1920

Eastern United States (humid portion), 17 Great Plains and Far Western States excluded

| Average Value of land per Acre | Acres of Crop land, 1919 | Net Decrease, 1919–25 | |
|---|---|---|---|
| | | Acres | Per Cent |
| Under $25 | 34,081,109 | 4,067,081 | 11.9 |
| $25–50 | 54,757,630 | 5,473,150 | 10.0 |
| $50–75 | 42,750,909 | 3,659,219 | 8.6 |
| $75–100 | 20,978,010 | 2,000,642 | 9.5 |
| $100–150 | 28,127,346 | 777,868 | 2.8 |
| $150–200 | 10,598,827 | 694,096 | 6.5 |
| $200–250 | 14,163,126 | 251,859 | 1.8 |
| Over 250 | 8,542,507 | 81,387 | 1.0 |
| Total | 213,999,464 | 17,005,312 | 7.9 |

also develop a significant increase in crop production per acre.

### THE NEED FOR LAND CLASSIFICATION

This uncertainty with regard to the trend in crop yields and the equally great uncertainty with regard to the trend of exports and imports, renders hazardous predictions of the acreage needed for crops beyond the next decade, as already noted. But it appears safe to assume that there will be some expansion in the crop acreage in certain portions of the United States and some contraction in other portions, consequently that selection of land for crops, pasture and Forest will be necessary. For there will be available for crops after 1940 doubtless a few million acres of crop land lying idle, probably over 100 million acres of plowable pasture in farms, 25 to 30 million acres of irrigable land yet unirrigated, in the neighborhood of 75 million acres of drainable land yet undrained, between 100 and 150 million acres of semi-arid land appropriate for dry-farming, and from 200 to 250 million acres of humid unimproved land mostly in forest or brush or pasture—in all, an aggregate of about 500 million acres, of which less than a half would be needed for crops to supply a population of 200,000,000, even if crop acreage expanded as rapidly as population, which has not occurred since 1900 and is not likely to occur because of the improvements in agricultural technique already mentioned. It is more likely, that not over a fourth of this land physically available for crops will ever need to be used for crops—unless the United States should be called on to contribute increasingly to the supply of foods and fibres for foreign nations. Rather it seems probable that the United States will, in the future, exchange more and more manufactured products for foods and raw materials.

But whether the United States resumes its rôle of bread basket for western Europe, or, on the other hand, becomes increasingly dependent on other parts of the world for food, these 500 million acres of land that may be used for crops or pasture or, in part, for forest, or even left to lie idle, constitute a great national, as well as local, problem, whose solution is of the utmost importance to the farmers of the nation.

The tendency will be, as it has been in the past, to bring more land into use for crops than is needed. Even during the years 1920–24, despite the most severe agricultural depression in the history of the nation, when 20 to 30 million acres of crop land lay idle, over 4 million acres of forest and cut-over land were cleared and made suitable for crops. Moreover, miscalculation by settlers as to the need for more crop land is likely to be more common in the future than in the past, because the increase of population gradually will become less, while progress in agricultural technique may become more rapid. Rising values of land cannot be counted on with that assurance which existed prior to the war.

One of the most fundamental questions relative to the future of agriculture in the United States, which must be faced, is, how will the selection of land for settlement be made? Will it be dependent, as in the past, on individual experience and knowledge, or rather ignorance, guided often by the selfish and sometimes short-sighted interests of land dealers; or will there be afforded the aid of an official land classification based on the best knowledge that the government can provide—not only with regard to the quality of the land, but also with relation to the economic prospect and the need for greater crop acreage?

On the answer to this question will depend the woe or the weal of millions of men and their families—not alone those who will settle on new farms, but also of many already engaged in farming. The artificial stimulation of agricultural settlement during the past half century, and consequent excess of land put into crops, has been one of the fundamental causes of the present agricultural depression. This, however, was excusable. No one could foresee the coming of the automobile and the tractor and the agricultural consequences, nor the increasing production of meat and milk per unit of feed consumed, nor did anyone realize the influence of shifts from less productive to more productive crops per acre, and from less productive to more productive classes of farm animals, upon the area of agricultural land needed. Moreover, prior to the World War no adequate evidence existed of the rapid approach of a stationary population; and the downward trend in per capita consumption of meat and milk from the beginning of the century to the beginning of the war indicated an increasing pressure of population on the food supply.

But now anyone can see that new forces are abroad in the world. The application of science and invention to agriculture appears to be advancing at an accelerating rate. Nearly all of these improvements promote agricultural production. During the past decade they have provided more food and better food for the increasing population without any increase in crop acreage. They may continue to do so, but it is probable that the net result of decreases of crop land in some regions and increases in other regions will be a slow and irregular increase for the nation as a whole. Such an increase will give renewed hope to the owners of idle land and stimulate a myriad of land agents into activity. Unless control over and guidance of agricultural settlement is provided for, there is grave danger of recurring periods of agricultural depression such as that which has now continued for eight years—indeed, the condition may become chronic.

# Transportation Rates and Facilities

By Harry Gabriel
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In order to understand better the effect of freight rates on agriculture, it may be well to trace their history since the beginning of the World War. In 1914 the Interstate Commerce Commission granted a 5 per cent increase on practically all of the rates east of the Mississippi River and north of the Ohio and Potomac Rivers. In 1917 rates were again advanced in this area; this time the advance was 15 per cent. In June, 1918, the United States Railroad Administration raised rates 25 per cent throughout the entire United States. This advance was followed by a two-year period of stationary rates which preceded the greatest rise in the history of freight rates. This rise took effect on August 26, 1920, and affected the entire country, although the amount varied for different sections. In the northeastern states rates went up 40 per cent; in the West, 35 per cent; and in the Far West and South, 25 per cent. The freight moving between these sections bore a rate 33⅓ per cent higher than previously. It must be remembered that prices had been rising all during this period of advancing freight rates. As a matter of fact, they had risen much faster than rates, and had attained levels far in excess of any levels ever attained by freight rates.

But unfortunately for the railroads, prices broke just before the last great advance took place. After this advance, rates stood at the theoretical levels of 211 in the Northeast, 169 in the West, and 156 in the Far West and South. General prices, together with prices of agricultural products which had stood much higher than freight rates when the advance was ordered, had crumbled to levels far below the new high rate levels by the time they took effect. Such a storm of protest arose that the railroads granted a voluntary reduction of 10 per cent on rates on agricultural commodities in January, 1922. This was followed by an order from the Interstate Commerce Commission requiring the railroads to reduce rates on all other commodities 10 per cent. This decrease became effective July 1, 1922, and was the last of any importance. Since that time, the Interstate Commerce Commission has been ironing out inequalities in the rate structure. As most of the revisions have been downward during this ironing out process, the rate level is now slightly lower than it was in 1922.

## Index Numbers of Freight Rates

The United States Department of Agriculture has calculated index numbers of freight rates which show the level of freight rates for the United States as a whole. These index numbers show that freight rates on agricultural commodities reached their maximum height in 1921, when they stood at 178, with the year 1913 representing 100. The latest figure available (December 31, 1927) for these index numbers shows the level to be 157.5 The agricultural price levels stand at 144. The Department of Agriculture has also calculated index numbers on individual commodities. The following table presents the 1927 level of these index numbers for these commodities. All of these reached their height in 1921 and were reduced in 1922. Most of them have declined since 1922, but the rates on cotton have advanced since that date.

INDEX NUMBERS OF FREIGHT RATES FOR 1927 *

| | Western District | Eastern District | Southern District | United States |
|---|---|---|---|---|
| Cattle | 153 | 199 | 136 | 158 |
| Hogs | 150 | 214 | ... | 161 |
| Cotton | ... | ... | ... | 166 |
| Sheep | 136 | 200 | ... | 145 |
| Wheat | ... | ... | ... | 150 |

* U. S. Department of Agriculture *Yearbook*, 1927, pp. 1176–1178.

The following quotation from the Secretary of Agriculture, appearing in his Annual Report for 1923, sums up in a nutshell the effect which freight rates are having on agriculture:

> High freight rates still prevail and, while not the cause of low farm prices, place one more additional burden upon the farmer which he can ill afford to pay in view of the prices he must take for his products. Also they place him at a disadvantage with his foreign competitors in world markets in the case of those farm products which we export.

While this statement was made in 1923, the same general situation still prevails at the present time.

## BURDEN OF HIGH RATES

The plea is often made that the farmer bears a very small proportion of the freight rate; nevertheless, he stands a sufficient portion to aggravate his depressed condition. Even though freight rates represent a comparatively small loss to each individual farmer, this loss comes at a time when he can ill afford any added expense. For eight years he has felt the pressure of high freight rates, and while in recent years this pressure may not have been excessive, the everlasting certainty of it becomes aggravating.

It will be noted that all of the major changes in freight rates were in the form of percentage advances and reductions. That is, all of the rates were increased by a definite percentage regardless of the value of the commodity. Percentage changes of freight rates are unduly severe on low-grade commodities because the freight rate represents a large proportion of their value. Therefore, when rates are increased by this method, the extra cost for freight rates is a great deal larger proportion of the sale price than the extra freight charges on more concentrated products. For instance, if the freight rate on a ton of hay is $5 and the rate is increased 40 per cent, the added charge is $2. This advance is a considerable portion of the value of the hay. On the other hand, if the freight on a pair of shoes is 10 cents and the advance is 40 per cent, the increased charge is only 4 cents per pair which is a very small proportion of the total value of the shoes. As most agricultural commodities, especially those produced in the Middle West, are bulky products, the added freight charge due to a percentage advance, is a greater burden on agriculture than a like increase would be on more concentrated products.

## SOME EXAMPLES

The burden of high freight rates falls unequally on farmers in different sections of the country. In this case, the man who can least afford to stand any added expense is the one who is hardest hit. A few farmers are distinctly better off with high freight rates. Let

us examine the case of California, for instance. California consumes more wheat than it produces. Accordingly, wheat must be shipped in from other states to supply the needs of consumers as well as for blending purposes. As California is deficit territory, then the price of wheat is based on the price in primary markets of the East plus the freight to California. The result is that a general reduction of wheat rates would ordinarily reduce the price received by the California farmer for his wheat.

Let us consider the case of the South for a moment. There has been much discussion about a diversified agriculture for the South, If such diversity takes place, the southern farmer will be a producer of wheat and hay instead of a buyer of these products. The southern farmer believes that cotton must remain the staple crop of the South, but for purposes of economy it is urged that each cotton farmer should himself produce whatever he and his farm animals require. The southern soil is capable of producing such essential commodities, and plans for the diversification and rotation of crops have made some headway. Naturally this has resulted in surplus production of grains and hay by many southern farmers.

Prices of grain in the South are based on the price at primary markets, such as Chicago, plus the freight rates to given points in the South. As the South is a deficit section in the production of grain, that is what will be paid under ordinary conditions. If the rates from such primary markets to the South are reduced, the logical result will be a corresponding lowering of grain prices at southern points. This will react to the detriment of the southern farmer.

On the other hand, as the Middle West is a surplus producing area for many commodities, it suffers greatly from high freight rates, and this is the section which can least afford to stand such an added expense. In this section, land values have decreased greatly. The prices of the commodities raised have been comparatively low. Nearly all the produce raised is shipped to other sections, and so must stand a freight charge. This is an added burden on a man who is already over-taxed.

The farmer who sells export wheat is in even worse case than the one who ships his produce to domestic markets. He comes into competition with more favorably situated farmers abroad. Other countries with a shorter haul to the seaboard can deliver wheat to the ships cheaper than the American farmer. As the price of exported wheat is fixed outside the exporting country, the net price is obtained by subtracting from the world price the cost of hauling and handling. If the freight rate to the seaboard is greater in one export country than another, then the country with the higher rate is placed at distinct disadvantage. Every freight rate advance, therefore, places an added burden on the farmer to the full extent of the advance. Export rates are considerably higher than before the agricultural depression began; consequently, the suffering of the middle western farmer has been considerably augmented by them.

The freight-rate situation is aggravated by the belief among farmers that the railroads are swimming in wealth and that the Government guarantees them a fair return on their investment. This is not the case, for while it is true that the railroads, as a whole, are very prosperous, yet there are some which are in a precarious financial situation. Also, the so-called guarantee is, in reality, not a guarantee at all but merely a guiding principle for the Interstate

Commerce Commission. The purpose of this so-called guarantee clause was to build up a system of railways prepared to handle promptly all of the traffic of the country. It aims to give the owners of the railways an opportunity to earn enough to maintain their properties and equipment in such a state of efficiency that they can carry well this burden.

It should be remembered, in fairness to the carriers, that although they have no doubt caused much agricultural suffering by the increase in rates, they have, by the same method, overcome one difficulty in their service which in years past cost the farmers immense sums. This is the loss caused by the lack of sufficient cars and engines to carry peak loads at the harvest season. In a report made to the Federal Reserve Board by the Chairman of the Board of Federal Reserve Banks of Minneapolis in 1924, the following appears:

> The losses a year ago, due to the heavy shortage of grain cars, stock cars, and in motive power, cannot, of course, be accurately computed. Farmers lost their markets through inability to move their crops at the right time. Stockmen took heavy losses through inability to load at the right time and through shrinkage because of the slow movement to market. The aggregate money losses were, in all probability, far greater than any amount that freight-rate reductions would have involved. It seems clear that the farmers' outstanding requirement is a full measure of prompt and adequate service. Questions of rates are of far less importance.

### INCREASE RATES NECESSARY

In 1920, after the carriers were released from Federal control, it became apparent that unless the carriers were given financial assistance in the way of increased rates, a breakdown in the transportation system of the country might result. If rates had remained low, railroads would have been unable to improve their equipment and car shortages would not have been eliminated.

The bulk of the national grain supply is produced in the West. The West, after supplying its own needs and the shortage of the eastern states, has a large surplus of grain and grain products which must find markets elsewhere. Much of this traffic must move long distances and this requires facilities for timely and efficient transportation without which these products would be of little value or benefit. Unless the railroads owning these facilities realize sufficient revenue to enable them to function with a high degree of efficiency, industry and commerce in general, including agriculture, will suffer. With higher rates, railroads have been able to so improve their equipment as to practically eliminate car shortage and thus save the farmers millions of dollars of loss annually.

During the past few years, railroads have efficiently handled a large volume of tonnage. It is of the utmost importance to the welfare of the country and of agriculture that the railroads be maintained in such a state that they can render such satisfactory service. Upon the flourishing condition of agriculture and transportation depends largely the country's permanent prosperity. To assist one of them unduly at the expense of the other at a time when neither is in an ideally prosperous condition would be of doubtful value to the country. On the other hand, it seems that agriculture has a lawful grievance so far as freight rates are concerned, and it is entitled to have the situation corrected even if it should become necessary to increase rates on other commodities.

# The Public Lands and Immigration

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Immigration does not flow in great volume from one country to another unless one country possesses a decided advantage in the ratio of population to resources or in cultural achievement. Prior to 1890 cheap land, sparsely settled, furnished the attraction which drew millions of Europeans to the United States in search of economic advancement. It is, of course, true that social conditions in the lands from which they came were factors of no little importance in their decision to migrate, but the choice of America as a new home was largely the result of the knowledge that farms could be secured at a relatively small cost. To some the United States was a "haven of refuge" from religious, political and class oppression, a "land of opportunity" where all might have freedom to worship as they wished and to be free from governmental interference in the details of their lives, but had it not been for the existence of a great public domain with almost unlimited possibilities for economic success, few would have chosen such a remote and unknown destination. It has been a popular pastime for school books to emphasize the more idealistic motives of immigrants, but a more scholarly examination of the evidence appears to discredit such popular traditions.

Considering the state of economic development, Europe may be said to have been overpopulated during the first half of the nineteenth century. This was especially true of the British Isles and Germany. In Ireland, for example, some eight million people were supported at a squalid level of existence in this period, and with the subsequent failure of the potato crop and abuses of the landlord system surplus millions were forced to migrate for economic reasons which were rationalized into religious and political excuses. This migration is largely responsible for the reduction of the population of Ireland to about four million people. Similar conditions, though perhaps not so sharply defined, existed throughout other parts of Europe with similar results up until the time when industrial development gave employment to added millions who could not have existed in an agricultural society.

The millions of landless Europeans who sought economic refuge in the United States were from the earliest times received with a mixture of hospitality and suspicion. It is easily understandable that the suspicion was least common in those areas where the public lands were readily available. Although these lands were the property of the entire nation, sharply divergent land and immigrant policies were advocated by different sections of the country.

## Sectional Interests in Immigration

The South sought severe immigration restriction in order that Western

lands might be reserved for an extension of the plantation system and slavery. If the West were opened for settlement by small landholders the political position of the free states would be strengthened. Moreover, many of the poorer white class of the South would be induced to migrate, to the supposed detriment of the South. With the exhaustion of the soil of the seaboard states under the wasteful slave system it was essential that new cotton and tobacco lands should be available for further exploitation. Thus the antagonism of this section to a liberal land policy which encouraged an unrestricted immigration is readily understood in spite of the fact that few immigrants went to the South. It is worthy of note that the Homestead Act was held off until the South was eliminated as a political factor.

The East opposed a liberal land policy, but was friendly to a large immigration, preferably of Protestants. Even in the early days manufacturers were anxious to build up a large labor supply which would be skilled, permanent and docile. Free immigration would serve this purpose, for a fair number of immigrants were skilled industrial workers and it was not impossible to train the others. A free land policy, however, tended to offset these advantages by reducing the numbers of immigrants who settled or remained permanently in the manufacturing states as well as by creating an independent spirit among employes. A land policy which would reduce taxation by making the public domain an important source of revenue of course appealed to the Eastern manufacturers and property holders more than one planned to encourage settlement. The agriculturalists naturally were desirous of having public lands open for settlement by members of their own community or group.

Free land and free immigration were favored by those states in which large areas of public domain existed. This attitude was the result of the theory that their prosperity depended on the rapid increase of population and the development of unoccupied territory. Another factor was the large number of foreign born who settled in these states early in the nineteenth century and were generally friendly to other aliens. For example, it is doubtful whether Lincoln would have been elected in 1860 had it not been for the support of the German vote which favored his liberal land policy. However, even had there been no foreign born in these areas the belief in the desirability of rapid utilization of undeveloped resources was so widespread that any other policies would have been unthinkable. After the Civil War and the subsequent development of Eastern industries, national attention was focused on the possible profits to be derived from the exploitation of natural resources so that a similar attitude was adopted by the East and held until the exhaustion of the public domain.

## SOME GAINS

While the benefits to be reaped from filling up the sparsely populated lands with immigrants in as little time as possible have been grossly exaggerated and while such a policy has in many places resulted in a careless waste of natural resources, there nevertheless have been certain gains secured through such procedure.

In the first place, newly developed farm regions are well adapted for the quiet assimilation of foreign elements which might easily produce serious cultural conflicts in a less happy environment. Rural districts are perhaps less tolerant than urban of divergent views on religious, moral and other social questions, but regardless of

this fact the Italian Catholic, the Russian Jew and the Bohemian Freethinker are likely to suffer fewer maladjustments as farmers than as industrial workers. The relative independence, the isolation and the long hours of labor of the farmer tend to prevent or make unnecessary the frequent, intimate contacts of diverse nationalities which may so easily arouse antipathies. It takes longer to assimilate the immigrant in the rural districts than it does in the city, but this longer time is of little consequence because differences and antagonisms do not create problems of the same magnitude for the farmer as for the city dweller.

In the second place, the immigrant settling on public lands increases the production of food supplies which are necessary for the growth of industrial and urban life. It is doubtful whether the economic expansion of the East would have been possible until a much later time had it not been for the surplus foods produced by the German and Scandinavian farmers of the Middle West. The fact that the surplus of food stuffs was sufficient for a long time to permit the United States high rank among the food exporting nations of the world must also be written to the credit of the immigrant farmer.

### SOME PROBLEMS

Whatever gains may have been derived from the fortunate relationship between the nineteenth century immigrant and the public lands of the West it must be conceded that it is possible to crowd too many people into any given area. The optimum population has been defined as that number of people which produces the greatest per capita return per unit of land at any given state of the arts. We cannot keep pouring immigrants into our rural districts and hope for adequate returns unless we have a blind faith that somehow or other a revolution in agricultural method will bring about an unheard of increase in yield. Of course, for years the public domain seemed so vast that any possibility of its exhaustion for generations to come was practically beyond belief. Consequently migrants from the East and immigrants from Europe were permitted and encouraged to pour into our sparsely settled territories to the end that prosperity might be assured the nation. The immigrant settler was desired for the good times he was sure to bring, and the idea that the great open spaces might soon be crowded or that cheap lands might jump in price to three, four, five hundred dollars or more per acre, occurred to but few individuals and their advice went unheeded.

It has been argued that the immigrant has really not increased the total population of the United States but that he has supplanted the expected increase of the native stock. The argument is usually supported by the theory that the native birth rate has been sensitive to the economic competition of the immigrant and by the observation that the native birth rate has declined most at the time and places of greatest immigration. The answer is that the native birth rate declined because of urbanization and industrialization, and that only in so far as the immigrant aided in the development of these aspects of modern life did he cause a reduction in the number of children born. It must not be forgotten that the birth rate has declined in all industrialized nations regardless of the amount of immigration into them. When all the evidence is considered it is safe to say that the rate of our population increase would have been appreciably less without the addition of immigration from Europe

and that our public lands would have been much more slowly exhausted.

### OUR LAND POLICIES

Historically the appropriation of public land in the United States may be divided into two periods: (1) that prior to 1862, during which the public lands were regarded as a source of revenue and (2) the period since 1862, during which the object of the Government has been to secure the development of the lands as rapidly as possible. The year 1862 does not mark a sharp transition from a policy of sales to one of free land, for sales continued on a considerable scale up until quite recent times, but after that year any person desiring a farm could secure it free of charge by fulfilling the requirements of the Homestead Act.

Under the land acts prior to 1862 land was sold in tracts as small as forty acres and as large as a half million acres. The price ranged from one to two dollars, though the bulk was sold at a dollar and a quarter per acre. The peak of sales was reached in 1836, when over 20,000,000 acres were sold for approximately $25,000,000. Few other years approached this in volume of sales, but between 1796 and 1862 about 157,000,000 acres were disposed of at a sum exceeding $186,000,000. This is a considerable amount when set down as a lump sum, but it is doubtful whether the public lands constituted a source of net revenue to the Federal Government during this period. In addition to this, some 68,000,000 acres allowed as bounties to soldiers were disposed of under acts passed prior to 1862. Much of the land alienated during this period found its way into the hands of immigrants, especially in the Northwest Territory.

The years following 1862 are marked by an extravagant disbursement of lands, not only through free homesteads, but also through grants to railroads, education, Indians, forest reserves, parks, and special grants. By 1890 the best of the public agricultural lands were exhausted, and settlers began to turn to semi-arid, cutover and swamp land. Sales of Indian lands, reclamation projects, and liberal grazing grants have continued to offer inducements to immigrants, but the opportunities witnessed during the years between 1862 and 1890 can never be duplicated. Since the beginning of Federal control, the record of our distribution of the public lands reads roughly as follows:[1]

| | *Acres* |
|---|---|
| Homesteads (including timber, desert and reclamation lands) | 256,000,000 |
| Sales (cash and credit) | 220,000,000 |
| Forest reserves, parks, etc. | 170,000,000 |
| Railroads, highways and canals | 137,000,000 |
| Education | 99,000,000 |
| Military bounty lands | 68,000,000 |
| Swamp land grants | 64,000,000 |
| Mineral and power reservations | 48,000,000 |
| Indian reservations | 35,000,000 |
| Timber and stone | 35,000,000 |
| Miscellaneous | 79,000,000 |
| Remaining public domain | 186,000,000 |
| Total | 1,397,000,000 |

The reaction from the exhaustion of our public lands has been marked since 1890. This is seen in the rapid rise in the value of farm land, and in the increase of tenancy, especially among young farmers.

### IMMIGRATION POLICIES

One would naturally expect that when the so-called free lands were practically exhausted there would be a sharp change in the public attitude towards further immigration. To a certain extent such a change occurred, but it was definitely held in check by industrial expansion which absorbed many more Europeans than had pre-

[1] Hibbard, B. H.—*A History of the Public Land Policies*, p. 570. Macmillan, New York, 1924.

viously gone to the farms. As the public lands decreased in acreage and attractiveness large scale factory production increased so that we had one form of economic inducement substituted for another in such a manner that the stream of immigrants increased more rapidly than ever. Public opinion, as usual, was split on the basis of self interest. The manufacturers and others who gained by having a large labor supply fought bitterly to keep the gates open. The laboring classes insisted just as bitterly that limits should be placed on the number of new residents to be admitted each year. The farmers, although less interested than the city workers for the simple reason that immigrants no longer came in large numbers to the rural districts, were, nevertheless, unfriendly. Restrictive legislation was finally forced through, beginning with the law of 1882 and continuing with increasing severity up through the laws of 1917, 1921 and 1924. After the free lands were used up the immigrant neither supplied food for the non-agricultural worker nor speeded the exploitation of rural areas. Instead, he became a severe competitor of the masses and as such was voted into minor importance by contract labor laws, literacy tests, quota acts and other restrictive measures. His usefulness gone, he was deserted even by his brother immigrants.

The explanation that the recent immigrant does not go to the farm because there is no farm land within reach of an immigrant's purse, now that the public domain has been exhausted, apparently has not occurred to many who shudder at the rapid rise of the city. It is alleged that he is of a racial type which does not take to rural life, in spite of the fact that in Europe farming was his main occupation. It is said that he wishes to have the fellowship and aid of his own kind by living in city communities of his own nationality where his own language and customs prevail, although it is well known that the German and Swede had no difficulty in finding such communities in Wisconsin and Minnesota. The claim is made that he is only a temporary resident intending to return to his native land as soon as a little money has been laid by, regardless of the common knowledge that he shows a relatively slight tendency to do so. The sixth revision (1926) of that standard text on *The Immigration Problem* by Jenks and Lauck, in two sections, entitled "Why the Immigrant Does Not Go to the Land" and "Getting the Immigrant on the Land," does not even mention the scarcity and high cost of land today as a factor. Changes which are considered undesirable must apparently be blamed on the immigrant and not on ourselves. Yet the fact is almost self-evident that the "new" immigrant from southern and eastern Europe stays in the industrial areas and engages in industry or commerce largely because there is nothing else for him to do now that free land is no longer an economic attraction.

It is sometimes said that the exhaustion of public lands has resulted in a shift in the race and nationality of our immigrants from the land-loving northern and western European to the wage-working southern and eastern European peasant. Almost all immigrants migrate primarily for economic reasons, and those who have come to the United States are no exception to this general rule. It so happens that the economic discontent which drove the English, Scandinavians and Germans to our country occurred early when free land was still available, while the Italians, Greeks, Slavs, and other "new" immigrants did not have sufficient incentive and knowledge to migrate to America until industry

offered the prime opportunity for economic improvement. It should be remembered that the Italian who migrates to Brazil is easily persuaded to become a rural dweller. Had the European push been reversed in time it would have been the southern European who settled out West and the northern European who manned our factories and mills. This does not mean that there may not be some small groups who would prefer the cities in any case. The majority, however, go where the opportunities are the greatest.

It has been pointed out that one of the advantages derived from immigrant settlement on public lands was the tremendous production of food stuffs which permitted the United States to become a food exporting nation. It follows that with the exhaustion of these lands and the shift to a predominantly urban population, this situation has been altered so that a smaller amount of food products can now be exported and more must be imported.

There has also been an increased difficulty of cultural adjustment between the foreign born and the native born. Part of this difficulty of adjustment grows out of the fact that the new immigrant comes to us with a cultural background in many respects fundamentally different from that of the old immigrant who for reasons of religions, language, political and other similarities with our early inhabitants fitted into our national life with a minimum of friction. But another not inconsiderable part is the result of jamming hundreds of thousands of foreigners into our cities, where speed of assimilation is much more essential than in the country, due to the more frequent and more intimate contacts with employers, traders, neighbors, and other individuals who are often of vastly differing customs and standards. The resultant irritations and open hostilities are quite obvious and cannot be avoided or minimized by an isolation at all comparable to that which may be enjoyed by the farmer in similar difficulties. The recent increased emphasis on "Americanization" work by our employers, schools, government and other agencies is in large measure an effort to develop a formal substitute which will assimilate rapidly a people who could take their time about it without much danger to themselves or their native-born neighbors if they but lived in newly opened, sparsely populated territory as did the early comers.

## A Sound National Economy

There is a popular tradition in our country to the effect that all immigrants entering the United States should spend a prolonged period of rural purification from things European. Based, as it probably is, upon the successful assimilation of German and Scandinavian farmers in the Middle West, this tradition assumes that their assimilation was thorough because it was carried on in rural districts. It is then but a short step to the conclusion that all immigrants should be sent to the farms.

Closer examination will show other reasons for this prevalent opinion. Rural residents are predominantly Protestant and north European. If these are the ideal bases for American citizenship it is wise to inculcate evangelistic religion, Anglo Saxon institutions, and democratic zeal as promptly as possible. Moreover, it is believed by many that our machine methods of farming and the steadily growing system of coöperative marketing should be especially efficient instruments for the adaptation of new arrival to American life. Horace Greeley's admonition to young men is still a hard-worked bromide, despite the fact

that the "West" of which he spoke practically disappeared thirty years ago. The ardor of city dwellers for home gardens, poultry farms and truck patches has cooled remarkably during the past decade, but shrewd consumers have not lost sight of the fact that a plentiful supply of farm laborers means cheap food, cheap clothing, and easier living in urban centers. The fantastic fiction that every farm home is a national asset serves a real purpose in keeping the market flooded with agricultural products, but it may not furnish a sound economic basis for the employment of our manpower.

Statesmen who would direct our surplus population toward agriculture for social reasons fail to distinguish between a class of prosperous, land-owning farmers and a class of poverty-stricken peasants. With the present speculative prices of land in our best agricultural areas, and the deflated prices of farm products, the purchase of a farm solely through its earnings is almost impossible. The barriers to ownership have increased until they have become almost insurmountable for the young man without means. Fifty years ago a young man needed only a horse, a few simple implements, and some seed to become a farmer, but at present even a tenant needs equipment costing as much as three or four thousand dollars to operate a sizable farm in the corn belt. Agriculture is at present a business of long hours, severe drudgery, and meager returns.

To send immigrants to our rural districts means simply to build up a class of farm laborers with a precarious subsistence. The present trend of agricultural economy is to supplant hand labor by machinery and to send the surplus workers into industry. For several decades the surplus population of many of our best farming regions has been poured into urban centers, and where replacements were needed they have been drawn from less prosperous rural districts. The increased productivity of the unit of farm labor has permitted simultaneous decrease of rural population and increase of agricultural production. There is no scarcity of farm labor, indeed there is a surfeit of labor when men can be hired to drive a one-horse plow. A sound national economy will direct labor toward the pursuits which offer the greatest rewards, and at present those rewards are to be found in industry.

The economic differential between industry and agriculture has accounted for the migration of hundreds of thousands of Negroes and the importation of thousands of Mexicans to urban centers since 1920. To direct immigrants to rural districts at present is to counteract a wholesome economic drift which promises to give us a smaller but more efficient, more prosperous and more intelligent farm population. If our country cannot afford the newcomers a status above that of peasantry or underpaid farm labor we should prevent their admission.

# Stabilization of Prices and the Farmer's Income

## The Need for Control of the Farm Supply

By J. S. Lawrence, Ph.D.
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SINCE the farmer has suffered from an unstable and inadequate income it may seem rather elementary to state that his problem is primarily a monetary problem. On conspicuous and numerous occasions it has been identified as such, and stabilization of the general price level has been urged as a specific remedy for the farmer's ills.[1] This obvious and plausible analysis and remedy, however attractive on first thought, fails to reach the heart of the problem.

This is not the place for a detailed consideration of the many proposals for stabilizing the general exchange value of the dollar. We know that formidable impediments militate against the early adoption of the best of these proposals.[2] Let us grant, however, that these obstacles have been swept aside or have lacked substance, that a plan has been adopted and that stability in the general price level has been achieved. By no means does it follow that the farmer can bid his troubles farewell.

### General Price Level

A true general price level is a weighted average of the price relatives of all commodities and services for which men offer money. Such an ideal measure of the value of money does not exist. We have approximations it is true, but the indices upon which we most depend are but distant approaches to this ideal. The wholesale prices of 550 commodities are employed to construct the index of the Bureau of Labor Statistics, but these commodities constitute only 5 per cent of all the goods and services for which we spend our dollars.[3] This is obviously neither an accurate nor fair measure of general purchasing power, and yet it is used for that purpose more frequently than any other index. The revised index of the general price level developed by Carl Snyder is perhaps the best measure of the exchange value of money which has yet been developed.[4] A general price level must necessarily be a mathematical concept dealing in averages, and it is an average of all prices, properly weighted, which our stabilization plans propose to fix. Within this average, the resultant of thousands of weighted price relatives, there is ample room for extreme fluctuations in the prices of single commodities and groups of commodities. The farmer is interested primarily in the prices of the crops which he must sell, and to lead him to believe that any plan for stabilization of the general price level will eliminate the fluctuations of the prices of the goods he has to sell is to lead him astray.

Much confusion prevails concerning the distinction between particular and general prices. While the latter may be substantially influenced by monetary policy, the former will display the effect of changes in the supply much more distinctly. It is clearly fallacious to hold that stabilization of the general

[1] Stabilization Hearings, H. R. 7895, 69th Congress, 1st Session, Part 1, p. 5.

[2] For a general treatment of this subject see the author's "Stabilization of Prices," The Macmillan Company, New York, 1928.

[3] Stabilization Hearings, H. R. 7895, pp. 593-594.

[4] *The Review of Economic Statistics*, February, 1928.

price level will stabilize the farmer's particular prices, or that the general price level may be so manipulated as to secure for the farmer a fair return for his efforts. Undoubtedly the latter was in the mind of the witness who in discussing the Strong Amendment asserted, "We do not want to start unless wheat and cotton and everything else is up." [8]

As a matter of fact, the adoption of any mechanical formula for stabilization of the general price level might well result in disturbances as serious as those which now flow from aberrations in the general value of the dollar.

Since the price level is a mathematical average, it follows that a change in the price of any single important group of commodities must be compensated by an opposite change in the price of an equally important group in order that stability in the general level may be maintained. Let us assume that there is a world shortage of wheat and that the United States has been so fortunate as to raise a bumper crop. The price of wheat and all its products would rise throughout the world. Since this grain bears a substantial weight in our general index, the latter would tend to rise. If we are determined to maintain a stable general level of prices it will be necessary to apply measures which will check this rise. Wheat will probably be strong enough to maintain its price position, but some other commodity, such as cotton, may find itself in a weaker position and be compelled to yield to the price pressure which our authorities are applying in their efforts to reduce the general price level. It will be a doubtful consolation to the cotton farmer of the South that his brethren of the Northwest have gained what he has lost and that the general purchasing power of the dollar has been maintained.

[8] Hearings on H. R. 11788, p. 105.

How far a stability of the general price level will fail to allay the misfortunes of the farmers, in so far as they are due to fluctuating prices, may be seen by a consideration of the general price level and the price of wheat and cotton over a representative five-year period.

### INDEX OF PRICES

The accompanying table gives us an index of general prices for the five-year period 1923–1927, together with an index of cotton prices and another for wheat. During this five-year period the general price level moves through a range of ten points, from 163 to 173; the price of wheat roams from 111.3 to 209.0, a range of 97.7 points; while cotton flits like some volatile spirit through the enormous range of 180.4 points between 96.4 and 276.8. It is little wonder that the farmer yearns for stabilization of prices, but it is stabilization of particular prices which he needs.

To assert that the reformation of the "unstable dollar" will relieve him of his ills betrays a misconception of the problem. It is doubtful if the adoption of stabilization of the general price level as the deliberate and conscious objective of Federal Reserve Policy could achieve greater stability than we have had during the five-year period under consideration. That the absence of marked oscillations has been the result solely of fortuitous factors cannot be maintained. It is certain that stability of general prices is a condition toward which any sound banking policy should be directed, but it is not the sole objective nor the most important. We may say that wisdom and skill in the administration of the Federal Reserve System added to favorable general conditions has made the remarkable general stability of this five-year period possible. The freedom with which the prices of cotton and wheat have been

INDEX OF PRICES

1913=100

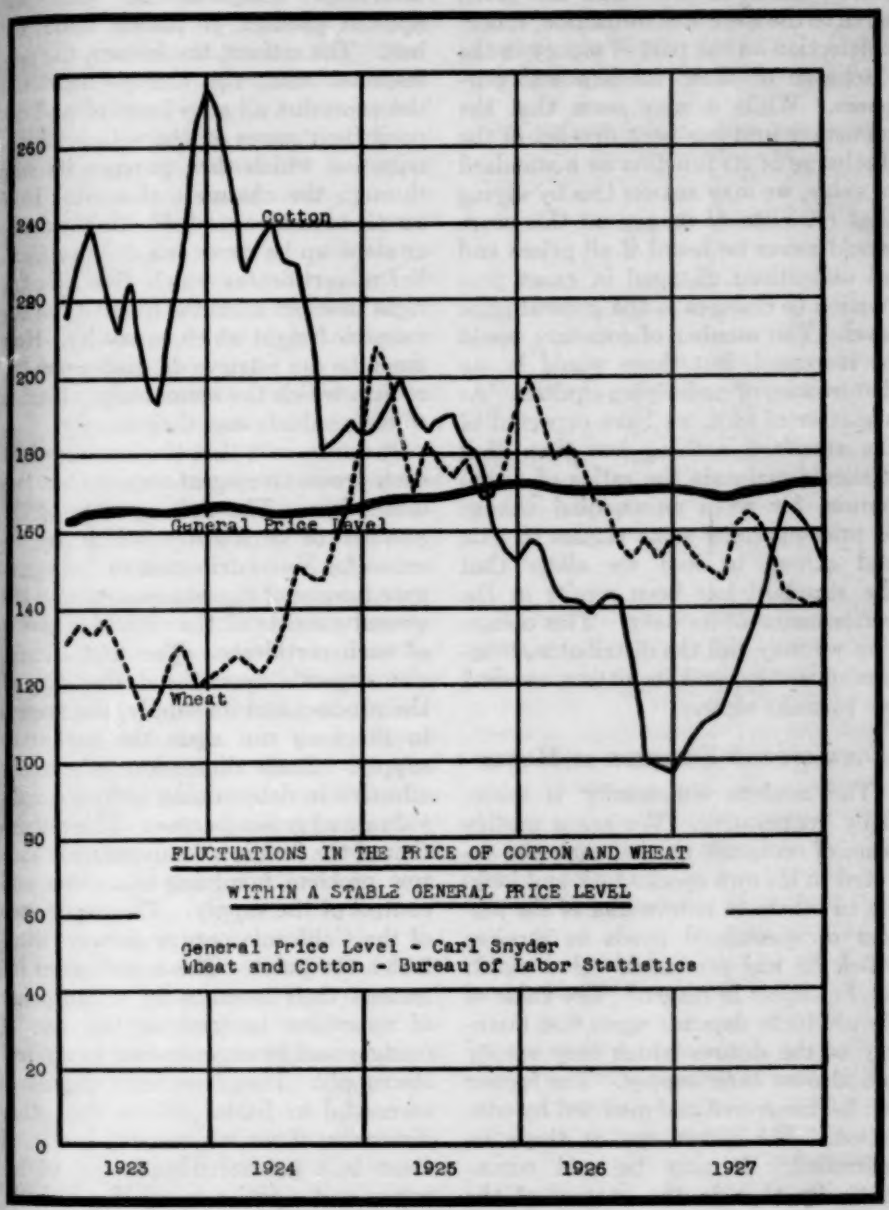
| Months | General Price Level | Cotton | Wheat |
|---|---|---|---|
| 1923 | (1) | (2) | (5) |
| January | 163 | 215.2 | 131.3 |
| February | 164 | 228.1 | 136.3 |
| March | 165 | 240.4 | 133.2 |
| April | 165 | 223.2 | 137.2 |
| May | 166 | 211.0 | 131.4 |
| June | 166 | 225.2 | 121.0 |
| July | 165 | 200.6 | 111.3 |
| August | 165 | 192.6 | 117.4 |
| September | 165 | 215.0 | 126.6 |
| October | 166 | 229.5 | 131.1 |
| November | 166 | 266.5 | 119.6 |
| December | 166 | 276.8 | 121.8 |
| 1924 | | | |
| January | 167 | 268.7 | 124.1 |
| February | 167 | 251.3 | 128.6 |
| March | 166 | 227.2 | 127.6 |
| April | 165 | 236.1 | 123.5 |
| May | 165 | 240.6 | 128.9 |
| June | 164 | 230.7 | 138.0 |
| July | 165 | 229.1 | 152.9 |
| August | 166 | 212.2 | 148.5 |
| September | 165 | 181.4 | 147.9 |
| October | 165 | 184.7 | 162.7 |
| November | 166 | 189.0 | 167.5 |
| December | 168 | 185.9 | 184.8 |
| | | (3) | (6) |
| 1925 | | | |
| January | 169 | 186.6 | 209.0 |
| February | 169 | 194.6 | 201.7 |
| March | 169 | 200.7 | 184.9 |
| April | 168 | 191.6 | 169.6 |
| May | 168 | 185.4 | 183.6 |
| June | 170 | 189.2 | 177.1 |
| July | 170 | 190.9 | 174.3 |
| August | 171 | 182.4 | 179.5 |
| September | 171 | 180.0 | 170.3 |
| October | 172 | 165.8 | 169.7 |
| November | 173 | 156.1 | 176.5 |
| December | 173 | 152.3 | 193.6 |
| 1926 | | | |
| January | 173 | 158.6 | 201.0 |
| February | 172 | 157.0 | 193.4 |
| March | 171 | 144.9 | 178.2 |
| April | 171 | 142.4 | 182.8 |
| May | 171 | 141.9 | 179.7 |
| June | 171 | 138.7 | 167.8 |
| July | 171 | 143.6 | 167.5 |
| August | 171 | 142.8 | 155.8 |
| September | 172 | 126.9 | 152.7 |
| October | 171 | 100.6 | 158.2 |
| November | 172 | 97.9 | 151.8 |
| December | 171 | 96.4 | 157.6 |
| | | (4) | (7) |
| 1927 | | | |
| January | 170 | 103.5 | 158.4 |
| February | 170 | 108.6 | 153.1 |
| March | 170 | 111.6 | 149.7 |
| April | 169 | 112.6 | 147.2 |
| May | 170 | 123.9 | 162.0 |
| June | 171 | 129.2 | 165.6 |
| July | 170 | 139.0 | 162.0 |
| August | 171 | 154.9 | 153.9 |
| September | 173 | 168.5 | 143.4 |
| October | 173 | 164.1 | 141.2 |
| November | 173 | 159.1 | 140.2 |
| December | 173 | 151.2 | 141.6 |

(1) Carl Snyder, "The Measure of the General Price Level," *The Review of Economic Statistics*, February, 1928, p. 12.
(2) Bureau of Labor Statistics, "Middling Cotton at New Orleans," Bulletin No. 390, pp. 50–51.
(3) *Ibid.*, Bulletin No. 440, pp. 50–51.
(4) *Ibid.*, "Wholesale Prices on Pre-War Base," 1928, pp. 34–35.
(5) *Ibid.*, Bulletin No. 390, pp. 36–37.
(6) *Ibid.*, Bulletin No. 440, pp. 36–37.
(7) *Ibid.*, "Wholesale Prices on Pre-War Base," p. 34.

able to move within this comparatively fixed general level gives point to the statement that any hope of general relief for the farmer through the adoption of any one of the many plans for stabilizing the value of the dollar is doomed to a considerable measure of disappointment.

While we wish to warn against the anticipation of exaggerated benefits from stabilization of the general price level, such a condition does constitute one broad factor favorable to the farmer. To illustrate its importance it will be necessary to deal for a moment in abstractions.

The literature of a stabilization has by implication invested the standard of payment with a new function. We are all familiar with the functions of



money emphasized in the classroom, *i.e.*, as a standard of value, of bank reserves, of accounts, of deferred payments, as a medium of exchange and as a storehouse of value. It has never been made clear how rising and falling prices, the condition which has given birth to the issue of stabilization, reflect a defection on the part of money in the discharge of these fundamental purposes. While it may seem that the monetary unit has been derelict in the discharge of its function as a standard of value, we may answer this by saying that criticism of money on this score would never be heard if all prices and all obligations changed in exact proportion to changes in the general price level. The number of counters would be increased, but there would be no disturbance of underlying equities. As a matter of fact, we have expected of the standard nothing less than that it should maintain the ratios of distribution, for when an unequal change in prices permits some classes to gain and others to lose we allege that the standard has been remiss in the performance of its duty. This obligation we may call the distributive function of money, and its nature we shall try to make clearer.

## DISTRIBUTIVE FUNCTION OF MONEY

The modern community is essentially coöperative. We are a motley team of economic agents, each one devoted to his own special task and looking to others to relieve him of the surplus of specialized goods or services which he has produced. How much can he expect in return? The value of his products depends upon the intensity of the desires which they satisfy and also on their supply. The former can be discovered and modified by education. The latter can at times be controlled. It may be said parenthetically that in the control of the supply lies the crux of the farm problem. Each member of the community makes his contribution to the aggregate of income.

Let us imagine that a vast conveyor belt is in operation and as each individual completes his task the finished product is placed upon the belt. The artisan, the farmer, the professional man, the entrepreneur and the capitalist all step forward and deposit their wares on the vehicle of distribution which then pursues its way through the channels of need. How are these men rewarded? As the farmer steps up he receives a definite number of certificates which give him the right to select a limited quantity of the valuable freight which moves by. How much he can retrieve depends upon the esteem which the community attaches to his products and their supply.

It can be seen that the income which each productive agent receives has two dimensions. The first consists of the number of certificates which he receives for his contribution to the aggregate income of the community and the second consists of the exchange power of each certificate. The first dimension depends upon the desirability of the product and its supply, the second in the long run upon the monetary supply. Each dimension is equally effective in determining ultimate individual and group incomes. The regulation of the first is a comparatively narrow problem involving education and control of the supply. The experience of the California orange growers illustrates the point. These producers increased their incomes by a campaign of education to increase the use of oranges and by organization to control the supply. They have been singularly successful in both. When the other dimension of our income area is altered there is a general disturbance of incomes and equities in existing wealth,

and if the change is substantial and rapid the mischief is far greater than that which follows a fortuitous change in the supply of any given commodity, since the latter affects the income of only a fraction of the community.

The monetary unit is expected to represent an unvarying claim against a definite portion of the income stream. Only in this manner can the real equivalents of monetary incomes, whose nominal magnitudes are determined by other forces, be maintained at a stable level. Upon the monetary unit, therefore, rests the responsibility of *fixing* the distributive shares of individuals and groups once those shares have been determined by the various forces acting upon the claims of agents to the income stream.

The determination of these shares in the first instance is in itself a disturbing process. The means employed suggest warfare. The worker organizes in order that his bargaining power may be greater, and resorts to artificial restriction of the supply and to strikes and even violence to secure for himself the maximum return which society can be persuaded or compelled to grant him. He will desist in his efforts only when convinced that for the time being he can do no more. Rarely does he feel that the value of his contribution to the social income stream has been fairly appraised or that the total of certificates which he receives represents rights to an equitable return.

It is pertinent to note that of all the major groups who contribute to the community income none is so impotent or inarticulate in asserting his rights to a proper share as the farmer. He is peculiarly at the mercy of disorganization and the vagaries of supply. Excepting the changes in the value of his certificates, due to the disruptions of war, the farmer has little to complain about that dimension of his income. It is in the determination of the total number of certificates, rather than the constancy of purchasing power, that he experiences the greatest difficulty.

During the last eight years the farmer's dollars, when spent for productive purposes or for living, have been exemplary in their stability. This is demonstrated by the following indices:

RETAIL PRICES PAID BY THE FARMER FOR COMMODITIES USED IN

| | Living | Production | Living and Production (1) |
|---|---|---|---|
| 1921..... | 165 | 142 | 156 |
| 1922..... | 160 | 140 | 152 |
| 1923..... | 161 | 142 | 153 |
| 1924..... | 162 | 143 | 154 |
| 1925..... | 165 | 149 | 159 |
| 1926..... | 164 | 144 | 156 |
| 1927..... | 161 | 144 | 154 |
| 1928..... | ... | ... | 157 |

(1) *Crops and Markets*, November, 1928, p. 439.

This is not an attempt to minimize the hardships which the farmer suffers as a result of general changes in the price level. When that occurs his distress is compounded for his income now suffers in two directions. His nominal income declines precipitately because agricultural products are among the first to feel the effects of a general decline in prices, and his real income suffers because many of the commodities which absorb a large part of his income lag in their fall and some, such as taxes, fail to respond to the pressure of a general decline. Certainly if all prices moved at the same rate and to the same extent there would still be disturbance and injustice in the relations of creditor and debtor, but the distress would be substantially lessened.

### EFFECTS OF PRICE CHANGES ON FARM INCOME

Since this paper is concerned with general price changes and their effects upon farm income, the ideal procedure would be to measure such income and correlate changes with changes in the purchasing power of the dollar. Unfortunately, our existing knowledge makes such a procedure impossible. Professor Black has conveniently assembled the results of our official surveys and questionnaires.[6] The figures are unanimous in showing a marked decline in farm income during the years 1920–1922. Similar testimony can be furnished by every other economic group, and the figures have certain defects which impair their usefulness in a study of this kind. In the first place, they cover too wide an area and give a picture that is altogether too general. In a country as great as the United States with every kind of agricultural occupation represented, a broad average blurs the portrait and destroys the details which constitute the heart of the farm problem. It is the plight of the wheat and cotton farmer which has placed upon the public forum the issue of farm relief. Our chart indicates the extent to which fluctuations of particular prices have brought distress to wheat and cotton areas. We have heard little complaint from the dairy farmer since he has fared well, comparatively. A national income average casts little light on the festering sores of the agricultural body, and, since local treatment is necessary for such an ailment, a broad diagnosis of the patient's general condition is of little value.

In the second place, there are such marked disparities in the incomes reported for the same period as to raise serious questions of the reliability of all farm income data. These irreconcilable disparities are illustrated in the income figures of four separate attempts for the years 1919 and 1920, included in Professor Black's article.

In the third place, the reports do not come consecutively to any extent from the same farms, although the returns in *Crops and Markets* for July, 1928, came from farmers, 35 per cent of whom had reported in the previous year.

[6] John D. Black, "Income Data from Farm Business Surveys," *The Review of Economic Statistics*, November, 1928, p. 179.

DISPARITIES IN FARM INCOME FIGURES

| Year | Farm Income from Surveys (1) | National Bureau Economic Research | | United States Department of Agriculture (4) |
|---|---|---|---|---|
| | | Bulletin No. 2 (2) | Bulletin No. 7 (3) | |
| 1919 | 2,041 | 2,070 | 1,681 | 1,186 |
| 1920 | 1,385 | 1,358 | 1,335 | 630 |

(1) Based upon farm management and cost statistics assembled in Yearbook of Department of Agriculture, 1925, pp. 1285–1311. Figures do not make allowance for farm living or farmer's labor.

(2) Includes estimate for value of living obtained from farm, but makes no deduction for unpaid family labor.

(3) Same as (2).

(4) Omits interest paid on actual farm debt, interest on farmer's investment, amount spent on farm improvements, value of food produced and used on farm, value of family labor including owner, and change in the value of real estate during the year.

Finally the reports come only from farm owners of the better class and from farms which are far larger than the average reported by the census.

These criticisms have not touched the formidable difficulties of income nomenclature. Our income figures are, therefore, a moving picture of changing income factors and help us little in the effort to determine the effect of changes in the general price level upon farm income.

Changes in the value of farm property have accompanied changes in the general price level. At the end of 1919 the current value of all capital invested in agricultural production exceeded 79 billion dollars, while in 1926 this amounted to a little more than 58 billion.[7]

Since there has been a constant addition of physical equipment in the form of implements and buildings, the difference between these two figures is actually less than the depreciation sustained. It is difficult to determine the extent to which the decline in the value of agricultural equities has been due to a general appreciation in the value of the dollar and to what extent it has been due to a weakening of the relative position of agriculture.

Further light may be cast upon this by a consideration of the location of bankruptcies during the period of deflation. It will be noted that the West North Central and the South Atlantic States contribute more than half the total failures throughout the United States. The former class contains the states of Minnesota, Iowa, Missouri, North Dakota, South Dakota, Nebraska and Kansas, states in which wheat farming predominates. The latter class contains states in which cotton is the traditional income crop. In other sections where failures are heavy we also discover the predominance of one or the other of these two crops.

Changes in the general price level from the very nature of the concept affect the United States as a whole, and it is reasonable to suppose that such harmful results as are due to fluctuations in the general price level would leave a trail of distress as clearly marked in one part of the United States as in another.

Subjecting the above figures for bankruptcy to analysis, we find that a trifle more than 6 per cent of all farms passed through bankruptcy proceedings during this period. In

[7] Yearbook of Agriculture, 1927, p. 1146.

FARM BANKRUPTCIES—NUMBER AND LOCATION

| (1) | 1922 | 1923 | 1924 | 1925 | 1926 | 1927 | Number of Farms (2) |
|---|---|---|---|---|---|---|---|
| U. S. total | 3,236 | 5,940 | 7,772 | 7,872 | 7,769 | 6,296 | 6,371,640 |
| New England | 92 | 146 | 196 | 169 | 145 | 105 | 159,489 |
| Middle Atlantic | 77 | 148 | 171 | 190 | 224 | 224 | 418,868 |
| E. N. Central | 247 | 569 | 684 | 760 | 844 | 719 | 1,051,572 |
| W. N. Central | 1,066 | 2,005 | 2,785 | 2,889 | 2,813 | 2,404 | 1,111,314 |
| South Atlantic | 678 | 959 | 1,085 | 1,037 | 747 | 585 | 1,108,061 |
| E. S. Central | 201 | 420 | 483 | 517 | 579 | 615 | 1,006,052 |
| W. S. Central | 264 | 539 | 788 | 650 | 764 | 567 | 1,017,305 |
| Mountain | 419 | 730 | 1,040 | 1,071 | 1,142 | 609 | 233,392 |
| Pacific | 192 | 424 | 540 | 589 | 511 | 468 | 265,587 |

(1) Yearbook of Agriculture, 1927, p. 1164.
(2) U. S. Census of Agriculture, 1925, pp. 4–5.

the Middle Atlantic States the proportion is 2.5 per cent, while in the West North Central the proportion is 12.7 per cent. Clearly the difficulties of this section are due to other than general causes. The cause lies not so much in the changing purchasing power of the dollar as in the inability of these farmers to get enough dollars for their products. We can go beyond this and say that fluctuation in agricultural prices are generally independent of movements in the business cycle, that wide variations occur between the products themselves, and that supply is a much more important factor in agricultural prices and income than any general price movements.[8] Stabilization of prices is of value to the farmer in that it assures him a fixed return for the dollar he spends, but that clearly represents but one side of his income problem.

[8] See Russell C. Engberg, "Industrial Prosperity and the Farmer," Institute of Economics, The Macmillan Company, New York, 1927, pp. 82–87, 260, *et seq.*

### THE PRICES THE FARMER PAYS

Let us see what has happened to the prices of some of the goods and services which the farmer finds it necessary to buy. On the upward movement of prices we find the farmers' products one step ahead of his principal cost factors. They paused on the crest of the price wave a trifle longer than some of the cost factors, but dropped more precipitately, started to recover very slowly and then had a second relapse.

Farm labor, implements, taxes and seed are substantially above the level of farm prices. Feed and fertilizer are slightly below. Taxes are far out of line. We may suggest, therefore, that further recovery of purchasing power for the farmer's dollars lies in a reduction in some of his expenses. Pressure should certainly be applied to taxes. The seed companies should try to make the farmer's dollar go further, and that applies to a lesser extent to implement manufacturers. Little can be done about farm labor since the farmer must

THE PRICES THE FARMER PAYS

| Year | Farm Labor (1) | Taxes (2) | Implements (3) | Feed (4) | Fertilizer (5) | Seed (6) | Farm Prices (7) |
|---|---|---|---|---|---|---|---|
| 1914 | 101 | 100 | 102 | 102 | 101 | 101 | 102 |
| 1915 | 102 | 102 | 102 | 98 | 113 | 117 | 100 |
| 1916 | 112 | 104 | 108 | 129 | 122 | 112 | 117 |
| 1917 | 140 | 106 | 134 | 186 | 139 | 141 | 176 |
| 1918 | 176 | 118 | 175 | 196 | 173 | 188 | 200 |
| 1919 | 206 | 130 | 178 | 208 | 185 | 264 | 209 |
| 1920 | 239 | 155 | 175 | 133 | 189 | 149 | 205 |
| 1921 | 150 | 217 | 176 | 91 | 159 | 125 | 116 |
| 1922 | 146 | 232 | 153 | 118 | 131 | 133 | 124 |
| 1923 | 166 | 246 | 165 | 128 | 128 | 142 | 135 |
| 1924 | 166 | 249 | 186 | 122 | 122 | 148 | 134 |
| 1925 | 168 | 250 | 175 | 131 | 131 | 170 | 147 |
| 1926 | 171 | 253 | 176 | 129 | 129 | 190 | 136 |
| 1927 | 170 | ... | ... | 123 | 123 | 192 | 131 |

(1) Yearbook of Agriculture, 1927, p. 1152.
(2) *Ibid.*, p. 1153.
(3) Engberg, *op. cit.*, p. 229.
(4) Yearbook 1927, p. 1153.
(5) *Idem.* (6) *Idem.* (7) *Ibid.*, p. 1152.

compete with industry and alternative opportunities for employment will enable the farmhand to resist reductions. On the whole these measures are palliatives and, while of aid to the farmer, their value should not be exaggerated any more than the value of stabilization of the general price level.

The chart tells most effectively the story of the farmer's difficulties and also indicates the direction in which the remedy should be sought. In the distribution of the community income he has been unable to assert himself effectively because of haphazard production and an incapacity to dispose, unaided, of his surplus. It is not sufficient to say that a fall in the price of wheat or cotton is compensated by an increase in the supply as much as it is caused by that increase. These two crops are produced in widely scattered areas and their prices are subject to world-wide influences. Thus a bumper crop in this country in 1924 brought a higher price per bushel than a smaller crop the previous year, although the next year a decline in domestic production accompanied a further increase in prices. Since the demand for these crops is rather inelastic, a small surplus has a disproportionately depressing effect on prices.

The unsatisfactory state of average farm income in the United States is but a reflection of the poor bargaining position of the farmer and his helplessness in the face of fortuitous factors of production and disorganization in marketing. Although our income statistics are not satisfactory, they do cast some light on the level of farm income. Since we are interested in farming as a business we shall calculate the return which the farmer receives for the exercise of his entrepreneurial functions.

In isolating the returns which the farmer receives as the wages of management we find they amount to less than $300 over a period of six years. When we consider that the average farm reported had an area of 291 acres and represented an investment of more than $16,500, this appears to be rather inadequate. On the other hand, we find that the compensation which he receives in other roles is equally unsatisfactory. As a capitalist with an investment of $13,000 he receives less than $400 a year. As a laborer he and his family receive a little less than $800. In this threefold capacity of laborer, capitalist and manager his aggregate annual income for the three functions amounts to less than $1,500.

To put the matter in another light, we might say, that if a farmer can secure one-fifth of his capital at a rate of interest not exceeding 6 per cent and the other four-fifths at a rate not exceeding 3 per cent and can persuade a group of people to work with the same energy, intelligence and interest which he and his own family bring to their tasks for an annual combined wage not exceeding $800, the business of farming will yield him, over a period of years, an average annual income not exceeding $300. At that he must be careful to secure a large and well-equipped farm. Farm management does not appear to be a lucrative profession.

This conclusion is supported by other evidence. At the time the Bureau of Economic Research concluded its study of national income, it was found that the farmers, though constituting about 30 per cent of the gainfully employed persons in the United States, received only about 17 per cent of the national income.[9] In the income returns for the year ending August 31, 1928, agriculture and related industries contributed less than one per cent of the total.[10]

[9] "Income of the United States," p. 62.

[10] Circular, National City Bank of New York, January, 1929, p. 15.

| | 1922 | 1923 | 1924 | 1925 | 1926 | 1927 | Average |
|---|---|---|---|---|---|---|---|
| Net income | 715 | 890 | 1,024 | 1,074 | 975 | 1,048 | 954 |
| Increase in inventory | 202 | 130 | 181 | 223 | 158 | 242 | 189 |
| Value of food consumed | 294 | 265 | 266 | 274 | 282 | 273 | 276 |
| Rental value of home | 302.75 | 328.25 | 367.75 | 392.75 | 353.75 | 390.75 | 356 |
| Increase in value of real estate | ... | ... | 145 | 173 | 2 | 49 | 42 |
| Total personal income | 1,513.75 | 1,613.25 | 1,983.75 | 2,136.75 | 1,770.75 | 2,002.75 | 1,837 |
| Interest paid | 230 | 230 | 230 | 225 | 215 | 201 | 234 |
| Farm improvement | 140 | 140 | 133 | 131 | 128 | 141 | 135 |
| Family labor | 760 | 870 | 789 | 793 | 779 | 769 | 793 |
| Decrease in value of real estate | 52 | 66 | ... | ... | ... | ... | ... |
| Interest on owner's equity at 3 per cent | 378.09 | 409.89 | 402.99 | 401.16 | 381.77 | 363.30 | 389.55 |
| Total expense | 1,516.09 | 1,715.89 | 1,555.99 | 1,550.16 | 1,503.77 | 1,474.30 | 1,552.70 |
| Net entrepreneurial income | —2.34 | —102.64 | 427.76 | 586.59 | 266.98 | 528.45 | 284.13 |
| Value of farm real estate and personalty | 16,430 | 17,490 | 17,260 | 17,122 | 16,308 | 15,445 | 16,676 |
| Estimated indebtedness | 3,827 | 3,827 | 3,827 | 3,750 | 3,583.33 | 3,335 | 3,691.56 |
| Estimated equity of owner | 12,603 | 13,663 | 13,433 | 13,372 | 12,725 | 12,110 | 12,985 |

EXPLANATIONS.—These figures are all based upon farm returns in *Crops and Markets*, July, 1928, p. 266.

The figure for rental value of the home is based upon the weight given to shelter by the National Industrial Conference Board in "Cost of Living in United States, 1914–1926," p. 58; 17.7 per cent of the average workman's budget is devoted to shelter according to series of surveys used by the N. I. C. B. most of which were made before the war. Since the index for rents is above the index for the cost of living (*ibid.*, p. 30), and inasmuch as the average farmer included in the above reports probably has a better home relative to his income than the average wage earner, a weight of 25 per cent was given to shelter for the farmer, *i.e.*, it was assumed that the rental value of his home constituted one quarter of the farmer's income.

The owner's equity in his farm was determined by capitalizing reported interest payments at 6 per cent and subtracting this figure from the reported value of the farm real estate and personalty. The farmer is allowed a return of 3 per cent on this equity since it appears that farms rented on a cash basis do not on the average yield the landlord much more than that on the estimated market value of his farm.

## SUMMARY

In conclusion we may say that the discontent of the farmer rests upon a substantial injustice in the distribution of the national income. His returns, by every test, are incommensurate with the contribution which he makes. The unsatisfactory state of average farm income is due chiefly to the existence of uncontrolled surpluses in two dominant farm crops, wheat and cotton. The effect of changes in the general price level upon farm income has been exaggerated. The farmer profits by rising general prices and suffers during a decline. Of far greater importance to him than changes in the

general price level are fluctuations in the prices of the particular commodities he produces. Stabilization of the general price level, while a distinctly favorable condition in a broad sense, is bound to prove an illusory remedy for the ailment of inadequate income. Solution lies rather in a control of the supply of farm products, however that may be achieved.

# The Increased Cost of Erosion

By Hugh Hammond Bennett
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SOMEONE recently said: "Progress is not how long you can keep a thing, but how quickly you can economically scrap it."

This statement doubtless has rightful application to machines employed in the speedy processes of modern mass production; but in the instance of our capital resources, the soil in particular, a scrapping process cannot in any sense be construed as contributing to national economic permanency. Nevertheless, we have, as a nation, been engaged in a program of land scrapping on a gigantic scale. That we have been more or less unconscious of the process makes it none the less menacing, because when the soil is washed away it cannot be economically restored, and because over vast areas the entire body of both the soil and subsoil is being removed.

Soil erosion as an agent of land depreciation and destruction constitutes the biggest problem confronting the physical side of land utilization in this country. The extent of the damage is incapable of accurate statistical measurement at this time owing to the small amount of information we have collected on the subject. The gathering of the pertinent facts is going to be a difficult undertaking, since the effects of erosion are highly variable within very narrow limits, due to soil, topographic, vegetative, and climatic variants. However, on the basis of observations, land and topographic surveys, and a few scattered measurements of field losses and of the silt load of rivers we are able to make some rough estimates.

We know that at least 513 million tons of suspended soil material and 270 million tons of dissolved matter are carried out to tidewater every year. The Mississippi alone handles 428 million tons of this traffic in wastage. Furthermore, it is an obvious fact that far more material is washed out of the fields and pastures and is stranded en route to the sea, on lower slopes, over valley lands, and in stream channels, irrigation ditches, and reservoirs each year than actually enters the sea.

Taking as a minimum basis of calculation 1,500 million tons of soil material annually washed out of the fields and pastures of the country, we find that the amount of potential plant food contained in this erosional débris, as determined by chemical analyses of the soils of the country, is 126 billion pounds, or 21 times the yearly net loss by the crops removed. The value of the principal ingredients in this wastage (the phosphorus, nitrogen, and potash) as determined by the cheapest commercial fertilizer carriers of these elements, is approximately $2,000,000,000. Of this there is evidence that the farmers of the nation sustain a yearly loss of not less than $200,000,000. Another part is a loss to the nation. Stream channels, harbors, irrigation ditches, and reservoirs are silted up, and more and more farm land passes from the productive to the non-productive class, or from the arable to the permanently non-arable class; and flood damages are enlarged by the increased amounts of silt and water entering the streams from the eroding slopes.

When the surface soil is washed off clay usually takes its place. This exposed subsoil, which the farmer must

now cultivate or abandon, is more difficult to plow, is less absorptive of rainfall, and loses that which is absorbed faster than the more spongelike humus layer now gone. The plant food in the raw sub-material is in less available form, and the farmer accordingly must use fertilizers or grow soil-improving crops in order to maintain his yields. Rainwater runs off the exposed impervious clay faster than formerly to increase the height and frequency of floods. An additional bad feature is that the erosion-exposed sublayers are usually more erosive than the virgin soil, vastly more so in the case of those gullied areas having soft materials, as sand or silt, in the deep layers.

The farmer must battle these erosion-induced land deficiencies. He must increase the strength of his implements and the draft power necessary to handle them. He must purchase fertilizers or devote time and labor to growing crops not for sale but solely to increase the productivity of his fields.

### GULLIED LANDS

In a single county of the southern Piedmont 90,000 acres of formerly cultivated land have been mapped as *rough gullied land* without value for cultivated crops. Once rated as good soil, this gullied area is permanently destroyed. It cannot be restored to arability, though it could have been saved.

In the southeastern Coastal Plain 73,000 acres of formerly cultivated land, including some of the best farm land of the region, have been mapped in one county as soil too gullied and too washed for further crop use. Gullies ranging to 100 feet in depth ramify broad areas where once there were fine plantations.

In the region comprising the excellent loessial soils of the lower Mississippi Valley there are counties having from 10,000 to 50,000 acres of land gullied beyond repair. Farming has been practically driven out of the uplands in some counties of this soil belt.

These wasted areas have developed since, not before, the wholesale clearing and cultivation of all kinds of land regardless of slope or soil. Deeply gullied fields characterize much of the Ohio Valley far back into the Appalachians. Along the Missouri and the Upper Mississippi farms are being abandoned because of the encroachment of gullies. In the unglaciated part of Wisconsin, the southwestern part, some farms have been ruined within five years. In one county of this region it has been estimated by the county agricultural agent that 60 per cent of all the farms have been damaged by gullying.

Land destruction by this process has been serious in many parts of the Southwest. Valleys with splendid deep grazing and irrigation soil have been completely ripped out by expanding ravines developed by erosion following overgrazing of the watersheds, or the valleys themselves, or both.

Probably not less than 17,500,000 acres of formerly cultivated land have been destroyed or rendered practically useless in this country because of gullying.

### THE EVILS OF SHEET EROSION

Bad as it is, it is not gully erosion that is doing greatest damage to our lands. Sheet erosion, that slower process of land washing which takes place more or less equally over the surface of entire fields, is the principal agent of land impairment. Its activities affect many times the area damaged by gullying. It goes on wherever there is enough slope for rainwater to run downhill, even in desert country where the precipitation is only three or four inches. On a 2 per cent slope in west-

ern Texas 40 tons of soil were removed from one acre with 27 inches of rainfall. Since fully 75 per cent of the cultivated lands of the nation are this steep or steeper, it can be seen that the possibilities of soil wastage are vast. While the washing will not proceed this rapidly on all soils, it will be serious, nevertheless, over most unprotected slopes. At the Missouri Experiment Station 40 tons of soil per acre were lost per year on a 6 per cent slope, and in North Carolina 25 tons an acre in the same time.

A single rainy period probably did more damage to thousands of fields in the region of silty soils of the Missouri River country above Kansas City during the fall of 1927 than could be corrected by a decade of crop rotations. More than 40 tons of soil were lost per acre from many fields of this region by sheet erosion during this one rainy season, and much of the young grain went with the soil. Nearly every depression made by the grain drill was converted into a small gully, and in places the wheel tracks grew into ravines 2 feet deep. A similar rainy spell came again in the same region in 1928 and doubtless did as much damage. At one place where a farmer had built an 8-foot dyke to keep the eroded matter coming out of the local hills off his fine Missouri River corn land the embankment was leveled up over a 40-acre field in 10 years. Here deposition took place over the entire field at the astonishing rate of 1,200 tons of soil per acre per year. The deposited material was less productive than the river alluvium it covered.

Already land is going out of cultivation in this region, which once consisted of some of the best upland soil of the United States. In a valley near the Missouri River a survey showed that 86 per cent of the upland area had lost from 8 to 40 inches of soil since clearing 40 years ago. Much of this is now so poor it has been abandoned to weeds. Even apple trees are dying on the eroded slopes.

### SOME ESTIMATED LOSSES

In the Piedmont County, stretching from New York City nearly to Montgomery, Alabama, along the east side of the Appalachian Mountains, it is estimated that a soil layer ranging from about 4 to 18 inches deep has been washed off of about 65 per cent of the area of 50 million acres. Some two and a half million acres of this region, formerly cultivated, have been destroyed by gullying.

Of the 17 million acres in the Southern Brown loam belt (the region of wind-blown, or loessial soils) probably 8 million acres have lost soil to a depth ranging from about 4 to 20 inches, and about 3 million acres have been wholly destroyed or made economically irreparable as the result of severe gullying.

The Northern Brown loam region of Missouri, Iowa, Kansas, Nebraska, South Dakota, and Illinois, with about 18 million acres, has already suffered severely over some 9 million acres of its extent.

Unglaciated southwestern Wisconsin, with some 11 million acres, has suffered severely from erosion over probably not less than one-third of its extent, and it is further estimated that 250,000 acres have been ruined or almost ruined with gulleys.

The Red Plains of Texas, Oklahoma, and Kansas, a comparatively new farming region of 36 million acres, is one of the most severely washed areas we have. Unless great changes are made in the agricultural practices in this part of the country, it appears that we will soon have here one of the outstanding examples of land misusage and wastage in the world.

Land impairment by erosion in the

West, particularly in the great southwestern grazing region, has been no less destructive than in the central and eastern states. Where there was good grass and herbaceous growth when the country was opened to grazing there is now, in numerous localities, very little forage. This is due to overgrazing and consequent removal of much of the soil by erosion following excessive diminution or destruction of the vegetation. As the result of this range depletion the number of livestock that can be carried has been greatly reduced for numerous areas. This is taking place extensively, not only on the 196 million acres of unappropriated, unreserved, and unregulated Public Domain, but on privately owned ranges and many of the Indian reservations. One sees and hears of "grazed-out" or "sheeped-out" areas all through this vast southwest country, under precisely the same conditions where, with proper regulation, the national forests have maintained excellent range conditions.

Not only are the ranges suffering and being ruined, but erosional débris from denuded slopes is filling irrigation ditches and reservoirs and covering fine irrigable lands of the valleys.

The Roosevelt and Elephant Butte reservoirs are silting up with material washed in from severely overgrazed portions of the watersheds; but the water users below are not alarmed about it, because at the present rate of silting several generations will be required to complete the job. That seems too long a time for concern to those who mistakenly think everything is all right until the reservoir is finally leveled to the top with silt. As a matter of fact, with a prolonged drought, such as has occurred in these regions, the water users would suffer as a result of the silting that already has taken place because of the lost storage capacity now occupied by the silt.

Exceedingly severe erosion and water losses also follow the burning off of the vegetation. Harding Reservoir in Orange County, California, is said to have been completely filled with débris as the result of a single rain that fell upon the watershed where a fire had destroyed the bush growth.

In a thickly populated district of the Southwest, costly concrete dams are being constructed as a means of flood control. The watershed above one of these was entirely burned over recently by a fire started from a lighted cigarette carelessly tossed among the bushes during the dry season. One heavy rainfall following this washed in enough soil, gravel, and stones to take up 10 per cent of the storage capacity created by the expensive dam.

Near by, from another burned-over watershed, so much sand was washed out into valuable orange groves that it cost the orchardists of a small locality $100,000 to remove the injurious deposit from about their trees. The cost in some groves amounted to $1,200 an acre, or half their value.

Rough estimates, the only kind that can be made in the present absence of accurate measurements, indicate that not less than 125 million acres of our farm land have been severely damaged by erosion, much of this having lost from 3 to 20 inches of soil from the surface. Many areas have been washed to greater depths. A large part of this eroding area is still in cultivation.

Costly washing, also, has extended out over 125 million acres more, and is getting worse all the time. Most of this is in cultivation. An undeterminable large area formerly cultivated has been abandoned. Part of this has been destroyed insofar as having value for crop production, some is being restocked with trees, and much is partly covered with worthless bushes, scrubby trees, and coarse grasses.

These estimates apply to crop land and land that once was used for crops. According to the Census, the total area of crop land in the United States for 1924 was 391,459,902 acres. In addition, there were tabulated under farm land 407,935,558 acres of pasture land, of which 190,271,444 acres were classed as plowable pasture and woodland pasture. Two other items, woodland not used for pasture and all other lands in farms totaled 124,923,892 acres.

Reviewing these estimates, it is seen that at the moment we are not on the verge of a land shortage. Nevertheless, we are cutting rapidly into our capital of good farm land and adding at an increasing rate to the area of marginal and worthless land through the agency of unrestrained erosion. The nation cannot afford such losses.

Looking at the situation from another angle, we see thousands of farmers suffering from the evil effects of this process of land impairment. That farms have been abandoned on a very large scale, and are being abandoned right along, is proof of this. When a farmer gives up his land and moves away because of the severely washed condition of his fields and pastures, the situation can generally be accepted as a bad one for the farmer. And when he has to buy from 400 to 600 pounds more fertilizer than he formerly did to produce as much cotton as he formerly did from one acre of ground, as is true of numerous fields, that, too, can be construed as unmistakable evidence of suffering.

Our farmers in some regions have maintained their crop yields fairly well by abandoning the more eroded areas and turning to their better lands, and by increasing their expenditures for fertilizers, soil-improving crops, and better implements of tillage. In many large areas, on the other hand, yields have been reduced materially, and this has been due largely or wholly to soil erosion in many instances.

Total expenditures for fertilizers in the United States, based on Census figures as reported in the 1927 Agriculture Yearbook, for the period 1879 to 1924, inclusive, were in excess of five billion dollars. Since then another billion dollars has been added to the bill. For the growing of crops used solely for soil-improving purposes the cost has been very large. We have spent many millions on soil-surveys, land classification surveys, topographic surveys, hydrographic and other surveys. We have experiment stations in every state and numerous substations and outlying field plots. These millions have been spent directly or indirectly largely in the interest of maintaining crop yields. And while carrying on these necessary labors and making these vast expenditures, we have done little and spent almost nothing in connection with methods of erosion control, although erosion is removing plant nutrients 21 times faster than the crops taken off the land, and with these nutrients the soil that contained them.

Mr. S. H. McCrory, Chief of the Division of Agricultural Engineering, U. S. Bureau of Public Roads, testifying before the Subcommittee of the House Committee on Appropriations, in Charge of the Agricultural Appropriation Bill, said on November 26, 1928: "The problem of soil erosion, I think, is the most important agricultural problem confronting the country today. In this connection I would like to read an extract from a letter from an appraiser for one of the Federal farm land banks:

"'Control of erosion is the greatest problem facing the rolling land corn and cotton farmer today. It is more important than the problem of farm credit, marketing, or farm relief. The

statement has been made that twenty times as much plant food is removed from the agricultural lands of the United States every year by erosion as is permanently removed by crops in the same length of time. An astounding statement! It is almost unbelievable, yet any one who has been an observer of soils and farming conditions in the Middle West for the past 25 years will testify as to the truth of the statement. . . .'

"'It is my conclusion that it is not a good policy to make long-time loans in the territory under discussion on farms which should be terraced to be successfully cultivated and on which farms there have been no terraces properly built and carefully maintained, nor should money ever be retained out on a loan until certain required terracing is done. . . .'"

## WHAT ARE WE GOING TO DO ABOUT IT?

From the statements and estimates above it can be seen that the problem of erosion is not only one of extreme gravity, but a problem the nation has taken very little interest in. The country has been very much asleep about the situation, with the exception of certain areas in the southern states.

At the present time numerous areas, large and small, are being cultivated throughout our farming regions, which are entirely too steep and erosive for safe tillage, even with the best protective measures that we know. These, of course, should be used only for trees or permanent pasture. In a little while it will be impossible to use them for any other purpose, as they will automatically pass beyond possibility of cultivation. In parts of the Appalachians steeply sloping ground is still being cleared for cropping where the farmers know that it will wash to bedrock within three or four years.

On the other hand, vast areas of eroding lands are in cultivation which could be given efficient protection with cheaply constructed field terraces, or contour embankments. This implement of soil conservation is being extensively used in parts of the southern states. In 1927, 494,000 acres were terraced in Texas alone, and a drive is on to largely increase the yearly program. The farmers there have seen what terracing means in saving fertile soil and in storing moisture in the ground for subsequent crop use.

These field terraces have been in use in parts of the older southeastern states for 75 years. They have saved much land, and also have failed in many instances. The failures have been due chiefly to improper construction. It was not known what type of terrace to build on certain kinds of soil, no thoroughgoing experiments having been made to find out.

North of Oklahoma and Tennessee terraces are seldom seen. The farmers generally do not know anything about them; many have never heard of a terrace. Others have not realized that their waning lands were suffering from erosion.

At the Spur Erosion and Water Conservation Station in west Texas the yields of cotton have been largely increased by the use of terraces. With level terraces all the rainwater was held in the fields in 1927 and 1928 on slopes ranging up to 4 or 5 per cent, and with it, of course, all the soil that would have been lost on unprotected areas (averaging 12.61 tons per acre for cotton and 21.76 tons for fallow). The yield of alfalfa also was largely increased.

In west Texas this work might appropriately be called the Spur Revolution. The results obtained are being translated into field practice, and according to all observations will be speedily applied to the greater part of

the region. This doubtless will go a long ways toward stabilizing production in this region where rainfall is so vital to plant growth. There will still be the possibility of insect invasion, but the hazard of soil and water wastage apparently is going to be largely eliminated on most farms. When one reviews these results, and talks with one county agent who has terraced 250,000 acres in this region, there is good cause for expecting immediate agricultural advancement for this section.

Also, when one sees, as did the writer, splendid results from terracing in west-central Wisconsin in 1927 (probably the first work of the kind done in that state), and likewise excellent results with the same method in western Kansas, any skepticism that may have existed as to the effectiveness of this method of protecting eroding land over wide areas vanishes immediately.

No time should be lost in giving the most exhaustive and widespread trials to this method of saving the soil and conserving rainfall throughout all the principal regions where the losses are going on.

Terracing has been emphasized as a means for saving soil and water because we know that these structures are effective for many kinds of land, and also because they can often be cultivated over about as easily as any other part of the field. There must be employed, as a matter of course, various types of dams and flumes to check the expansion of various types of gullies. Grazing must be regulated on the ranges and in the pastures. Trees and grass must be resorted to in order to save the steeper slopes. Certain vines, grasses, and trees will be needed to hold some eroding areas. Even chemicals may be needed in some instances. And there is need for devising better terracing implements. And there is vast need, also, to obtain the fundamental data relating to the physical processes involved in erosion: why some soils erode faster than others; why a terrace that functions admirably in one place fails in another with the same slope and rainfall. We need to know what is happening to the vast area of formerly cultivated land now lying idle. Additional information as to the relation between eroding lands and floods is sorely needed immediately.

The task of putting chains on the evils of soil erosion on a large scale is going to be a very difficult one. It is going to tax our best efforts, even with widespread coöperation of soil scientists, engineers, practical agriculturists, the extension agencies of the nation, bankers, merchants, and railroads. Delay will only accentuate the difficulties because erosion gathers momentum as the surface soil is removed.

# Reclamation Projects and Their Relation to Agricultural Depression

By Millard Peck

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During the past seven years there has been a considerable amount of speculation as to the effect of extending land reclamation at a time when the prices of many agricultural products were already depressed. Those who favor the reclamation of additional land for agricultural use contend that the additional quantities of agricultural products brought forth would be so small they *would not* have an appreciable effect on prices. Those opposed to further reclamation hold that, on account of the inelasticity of demand for most of the staple agricultural products, an increase in production *would* affect prices appreciably. The Federal Government is financially involved in land reclamation and has it within its power to encourage or discourage further expansion. The formulation of a sound Federal reclamation policy should be based, partly at least, upon the effect of increased production on prices.

Since the beginning of its existence the Federal Government has had a hand in the reclamation of its lands for agricultural use. Its interest in the development of the public lands is reflected in the Swamp Land Acts of 1849, 1850, and 1860, the Desert Land Act in 1877, the Carey Act in 1894, the Reclamation Act of 1902, the Irrigation District Act of 1916, the Oil Leasing Act of 1920, and the Federal Water Power Act also enacted in 1920. Much of the present discussion regarding the expediency of land reclamation is concerned with the use of the "Reclamation Fund" provided for in the Reclamation Act of 1902.

## Importance of the Irrigated Area

In 1919 there were 19,191,716 [1] acres of land in the United States under irrigation. In the same year there were approximately 484,000,000 [2] acres of improved non-irrigated land in use in this country. These figures afford a rough indication of the relative extent of the irrigated lands. Roughly, the land under irrigation is 4 per cent of the total area of improved land in the United States.

The area in the Federal irrigation projects constitutes about 6.5 per cent of the entire area under irrigation.[3] In 1927 there were harvested on the Federal irrigation projects 1,706,785 [4] acres of crops as compared with a total of about 357,000,000 [5] acres for the entire United States.

Table I shows the yields of the principal crops grown on the Federal irrigation projects in 1927 and the total yields of the same crops grown in the United States in 1924.

The percentage of the various crops grown under irrigation ranges approximately from one to 22 per cent of the production for the United States as a whole. According to Teele the *value* of irrigated crops in the United States

[1] "Economics of Land Reclamation," R. P. Teele, p. 27.

[2] Yearbook, United States Department of Agriculture, 1921, p. 430.

[3] "Economics of Land Reclamation," R. P. Teele, p. 87.

[4] Annual Report of the Secretary of the Interior, 1928, p. 334.

[5] Based on United States Census of Agriculture, 1925, and subsequent acreage changes of nineteen principal crops.

TABLE I—YIELDS OF CROPS GROWN ON FEDERAL IRRIGATION PROJECTS IN 1927, AND THE TOTAL YIELDS OF THE SAME CROPS GROWN IN THE UNITED STATES IN 1924

| Product | United States* | Federal Irrigation Projects† | |
|---|---|---|---|
| | Bushels | Bushels | Per Cent |
| Corn | 1,823,900,000 | 1,673,000 | .1 |
| Oats | 1,304,600,000 | 1,216,000 | .1 |
| Wheat | 800,900,000 | 4,863,000 | .6 |
| Barley | 159,100,000 | 1,954,000 | 1.2 |
| Rye | 55,700,000 | 109,000 | .2 |
| Potatoes | 352,500,000 | 10,543,000 | 3.0 |
| | Tons | Tons | |
| Hay | 88,400,000 | 1,414,000 | 1.6 |
| | Number | Number | |
| Horses and mules | 22,000,000 | 88,000 | .4 |
| Cattle | 60,800,000 | 181,000 | .3 |
| Sheep | 35,600,000 | 307,000 | .9 |
| Hogs | 50,900,000 | 128,000 | .3 |

* United States Census of Agriculture, 1925.
† Annual Report of the Secretary of the Interior, 1928, p. 334.

is probably not far from 6 per cent of the value of all crops raised. The *quantity* of crops raised under irrigation is about 10 per cent of the total United States production. The value of crops raised on Federal irrigation projects in 1927 was about $72,047,000,[6] while the value of all crops grown in the United States in 1927 was $8,538,183,000.[7] The value of crops grown on the Federal projects in 1927 was, therefore, about 1 per cent of the value of the crops grown in the United States in 1927.

## EFFECT OF PRODUCTION ON FEDERAL PROJECTS UPON AGRICULTURAL PRICES

Although the value of farm crops raised on the Federal projects is only about 1 per cent of the value of crops in the United States as a whole, their production does have an appreciable effect on agricultural prices. This effect can be approximately determined by taking into account the additional production of the irrigation enterprises and the elasticity of demand for each of the products. The elasticity of demand for a few of the leading agricultural products, potatoes,[8] wheat,[9] corn,[10] cotton,[11] hogs,[12] beef,[13] and lambs,[14] has been analyzed, and for these products

[6] Annual Report of the Secretary of the Interior, p. 334.
[7] *Crops and Markets*, December, 1928, p. 443.
[8] "Factors Affecting the Price of Minnesota Potatoes," Holbrook Working, Minnesota Agricultural Experiment Station, Technical Bulletin 29.
[9] "Forecasting the Price of Wheat," Holbrook Working, *Journal of Farm Economics*, July, 1927.
[10] Unpublished data, Bureau of Agricultural Economics.
[11] "Some Interrelationships Between the Supply, Price and Consumption of Cotton," L. H. Bean, Mimeo. Pub., Bureau of Agricultural Economics.
[12] "Factors Affecting the Prices of Hogs," G. C. Haas and Mordecai Ezekiel, United States Department of Agriculture, Bulletin 1440.
[13] Unpublished data, Bureau of Agricultural Economics.
[14] "Factors Related to Lamb Prices," Mordecai Ezekiel, *Journal of Political Economy*, April, 1927.

the effect of variation in production on price is more or less definitely known.

Let us take the case of potatoes. According to Working, "where production is 10 per cent above normal the price will probably be 17 per cent below normal." In 1927 there were produced in the United States 10,543,000 bushels of potatoes on Federal irrigation projects and 391,606,000 bushels outside of Federal irrigation projects which were sold at an average price of 97 cents. Assuming then that the Federal irrigation projects increased production by 2½ per cent, the price on the above basis was depressed by approximately 4 per cent, that is to say from $1.01 to 97 cents.[15] A 4-cent loss on 391,606,000 bushels amounts to $15,664,220. At the same time the gross income obtained from the 10,543,000 bushels raised on the Federal irrigation projects at 97 cents per bushel amounted to only $10,226,710. The 15½ million dollar loss to potato growers outside the Federal irrigation projects was about five and one-half millions in excess of the income obtained by potato growers on the irrigation projects. This is explained by the inelasticity of demand for potatoes. Due to the character of demand for agricultural products, it frequently happens that an increase in the quantity produced reduces the total income for the crop. Such was the case with potatoes in 1927.

Let us examine the situation with respect to cotton. In the crop year 1927–28 the United States crop and carryover was approximately 21,000,000 bales, 140,000 of which were produced on Federal irrigation projects. According to Bean's study cited above, an increase of one-seventh of a million bales, when the crop and carryover is in the neighborhood of 20,000,000 bales, depresses the price by about two-sevenths of a cent per pound. On this basis the producers of cotton outside the Federal irrigation projects suffered a loss of two-fifths of a cent per pound, or $40,000,000 on the crop. At the same time the return to the producers on the Federal irrigation projects from both cotton lint and cotton seed was only $16,705,727.[16] Here, as in the case of potatoes, the production on the Federal irrigation projects had the effect, because of the inelasticity of demand, of reducing the total returns received from the sale of cotton in the United States in 1927.

The production of wheat in the United States in 1927 was 871,000,000 [17] bushels, 4,800,000 of which were raised on the Federal irrigation projects. According to Working, "when the supplies are 10 per cent in excess of normal, the price must drop to something like 70 to 78 per cent of normal." On this basis it is found by the process of calculation used above in the case of potatoes and cotton, that the production of wheat on Federal irrigation projects in 1927 had the effect of decreasing the returns to wheat producers outside the irrigation projects by about six-tenths of one cent per bushel, or $5,196,000. This was almost exactly the crop value of the wheat raised on the Federal projects in 1927.

The coefficient of elasticity of the demand [18] for corn is about −1.00. In view of the relatively small production of corn on the Federal projects its production may be assumed to have

[15] Potato production in 1927 was slightly above the normal production for the period 1910–1927, but not enough to invalidate this conclusion.

[16] Reclamation Table 20, Annual Report of the Secretary of the Interior, 1928.

[17] Bureau of Agricultural Economics, Estimates of the Crop Reporting Board.

[18] "Principles of Economics," Alfred Marshall, 8th ed., p. 102: "We may say that the elasticity of demand is one if a small fall in price will cause an equal proportionate increase in the amount demanded."

no appreciable effect upon the price received for the United States crop.

There are no data covering the production of beef cattle, hogs, and lambs on the Federal projects. The coefficients of elasticity for these classes of livestock are: −.75, −.54, and −1.55 respectively. If the production of beef cattle and hogs were carried on to any considerable extent it would have a pronounced effect on prices due to the inelasticity of demand for these products. The demand for lambs is quite elastic (coefficient, −1.55). It is highly improbable that their production on the Federal projects would appreciably affect lamb prices.

It is often said in support of Federal irrigation reclamation that the crop production on these projects does *not* represent an increase in the size of the nation's crops. It is said that this is due to the fact that the farmers living on the irrigation projects were formerly engaged in farming elsewhere or that this same land was producing a certain amount of foodstuffs even under dry-farming methods. If the reclamation of these lands does not represent an increase in production, then the Federal Government is to be criticized for encouraging their reclamation in view of the fact that the present projects had cost the Government by 1922 not less than $70,000,000,[19] and approximately $7,000,000 annually since then.

The production on the Federal projects probably does not represent by so much a net increase in the nation's agricultural production. On the other hand, it probably is not true that the Federal irrigation projects contributed nothing in the way of an increase in the nation's supply of foodstuffs. Their contribution doubtless lies somewhere between the two extremes. To whatever extent either tendency prevails, however, the policy of extending Federal reclamation is open to criticism. If production is increased prices are depressed; if production is not increased the nation receives no compensation for the expense involved in reclaiming the arid lands.

Among those who object to the Federal reclamation policy there are those who contend that there should be no further reclamation at any place, under any circumstances, until the general level of agricultural prices has become considerably higher. This is a narrow view. It fails to recognize that land like machinery may become "obsolete" and that certain land which was satisfactory for agricultural use in the self-sufficing period of our agriculture may need to be supplanted by other land adapted to the modern agricultural technique. This is not to say that all land which *can* be irrigated *should* be irrigated, but it does say that if there is land which will support satisfactory standards of living that can be reclaimed without a subsidy, it should be reclaimed even though farmers on "obsolete" lands should suffer from the increased competition.

There is another group which contends that since reclamation is financed by the West itself through the Reclamation Fund, that is to say, through the receipts from the sales of public lands within sixteen of the Western States, from bonuses, royalties, and rentals from petroleum and other mineral leases, and from repayments by water users on existing Federal irrigation projects, the limit to the extension of reclamation should be fixed by the size of the Reclamation Fund.

[19] "Economics of Land Reclamation," R. P. Teele, p. 71. See also "Land Reclamation Policies in the United States," R. P. Teele, United States Department of Agriculture, Bulletin 1257.

### COMMON FALLACIES IN THE ARGUMENT FOR EXTENSION OF RECLAMATION

One of the more commonly stated fallacies in the argument for extension of Federal reclamation is that reclamation projects invariably expand the market for eastern manufactured products. It is often said that "irrigation enterprises make more of a market than they fill." In the House hearings on "The Columbia Basin Project" one of the witnesses states that "reclamation concerns the East as well as the West," and attempts to prove this by stating that the Yakima Valley received during 1927, $30,120,000 worth of automobiles, farm machinery, hardware, dry goods, drugs, musical instruments, agricultural produce, millinery, etc., from Eastern points. To support further the contention that the East benefits from Western reclamation, he says also that

> In 1923 there were shipped into the Salt River Valley project in Arizona 7,935 cars of freight from 42 States and that in 1927 there were 19,084 cars shipped in, a gain of 11,149 cars in four years over the 7,935 cars in 1923.

The irrigation projects cannot be credited with all of this additional commerce. The people living on the projects, at least on the newer ones, had previously lived elsewhere and were consequently consumers of manufactured products.

In view of the low incomes farmers obtain on some of the irrigation projects it is quite probable that, to the extent that the farmers came from the older farming areas, they might have had still larger incomes. In so far as this is true, the "outlet for Eastern manufactures" has been contracted rather than expanded. The Eastern manufacturers' interests are best served when farmers are located where their economic productivity is at the highest level possible.

A second fallacy commonly found in the argument for the extension of Western reclamation is that it is self-supporting, being financed by the West itself through revenue from the sale of public lands, income from oil leases, repayments from water-users, and other less important sources. The late Mr. Teele,[20] after an exhaustive analysis of the subsidy involved in existing Federal irrigation projects, came to the conclusion that the Federal subsidy through the extension of interest-free credit had amounted by 1922 to not less than $70,000,000. Since 1922 the subsidy in the way of interest-free credit has been piling up at the rate of about $7,000,000 annually. In addition, adjustments have been made in recent years with water-users whereby a part of the construction costs charged to the water-users have been written off.[21]

Aside from the income obtained from water-users on the existing irrigation projects, by far the larger part of the annual accretion to the Reclamation Fund is from receipts from oil leases on public domain. Students of government agree, generally, that the revenue from the public domain should be used for the support of the Federal Government and does not belong to a particular section of the country. Most of the uneconomic expansion in land reclama-

[20] "Economics of Land Reclamation," R. P. Teele, p. 71. For a more recent statement of the reasons why interest should be calculated in reclamation costs, see "Economic Problems of Reclamation," Alvin Johnson and E. C. Branson, p. 4. Published by the United States Department of the Interior.

[21] The reasons for writing off part of the construction charges are found in "Extension of the Time for Payment for Settlers on Government Reclamation Projects," Hearings on H. R. 8836 and H. R. 9611, 68th Congress, 1st Session, and in "Federal Reclamation by Irrigation," Senate Document 92, 68th Congress, 1st Session.

tion would end if the revenue now going into the Reclamation Fund were to be used for the support of Federal Government. Without the Reclamation Fund the

> irresistible temptation to Congress to provide for the construction of new projects at a time when there is no need for the land and only the remotest chance of success in getting settlers on the land when reclaimed, or of success of the settlers if they go on this land [22]

would be removed and every project would stand or fall on its own particular economic merits.

Another of the frequently stated fallacies in the reclamation argument is that relating to the "increase of taxable wealth created by reclamation." Statements of the type cited below [23] are found repeatedly in the agitation for the extension of reclamation. The argument that reclamation "increases taxable wealth" naïvely fails to take into account that these same farmers in the reclaimed area had previously lived elsewhere, that their migration merely transferred wealth from one place to another and that generally speaking what was gained in the way of taxable wealth in the new area was lost to the old. Since farm incomes have been low on some of the irrigation projects it is probably the case that the nation's taxable wealth would have been greater had these particular irrigation projects not been developed. To the extent that individuals are persuaded to move from regions where high incomes prevail into regions where low incomes predominate the nation's "taxable wealth" is diminished.

It is often fallaciously said that the size of reclamation enterprises is so great that private interests will not undertake their development and that the development therefore must be undertaken by the State or Federal Governments. Now there may be certain peculiarities about irrigation enterprises which require that they be developed by government rather than private interests, but "size of undertaking" is not one of them. Private capital is almost invariably available for large undertakings wherever the promise of gain shows itself on the horizon. Private capital, for example, has undertaken to finance the Beauharnois Canal project on the St. Lawrence River which provides for the construction of a power canal 14 miles long and a dam 4,000 feet wide with an 83-foot fall of water capable ultimately of generating 2,000,000 horsepower. This project involving an expenditure of $150,000,000 financed by British and American private capital shows that private enterprise can be depended upon to interest itself in the development of those natural resources which offer reasonable assurance of profit. The cost of the Beauharnois project will be only slightly less than the total cost of all the existing Federal irrigation projects. As a matter of fact, private capital has interested itself in the development of those land reclamation projects which seemed to offer the prospect of satisfactory financial gain. In recent years private capital has avoided irrigation development not because of the size of such undertakings but because of the absence of the prospect of reasonable financial returns.

The agitation for further reclamation by irrigation is founded partly on the

[22] "Economics of Land Reclamation," R. P. Teele, p. 322.

[23] Hearings, House of Representatives on H. R. 7029. "The Columbia Basin Project," p. 117; "The development of the Columbia Basin will add $600,000,000 to the taxable property of our State and it is not at all unlikely that the Government also would receive considerable benefit from it in the form of income and other taxes."

assumption that the population of the United States will increase by 1,500,000 [24] annually and that the population of this country will have reached 150,000,000 by 1950 and 165,000,000 in 1960.[25] It is assumed also that 40,000,000 more acres of crop land than were used in 1920 will be required to meet the food requirements of 150,000,000 people.[26]

The rapidly declining birth rate in this country and the world over, coupled with our restrictive immigration policy, indicates a probability that our population may fall short of 165,000,000 in 1960. The importance of taking birth control into account in planning for future agricultural production is suggested also by the fact that from 1918 to 1925 the number of children in the first grade in the public schools of America decreased from 4,281,013 to 3,923,492,[27] a decrease of a third of a million. The Bureau of Education says [28] that "The reduction in the birth rate is a factor that should not be overlooked. This rate has dropped from 25.1 per thousand population in 1915, in the registration area, to 20.6 in 1926. . . . Applying the birth rate and the infant mortality rate for each year, this means that 22.5 children per thousand of the population reached the age of one year in 1916, and less than 20 per thousand in 1926. Applying the same rates to the estimated population for each year indicates that 2,239,000 children reached their first birthday in 1916, and 2,292,000 reached it in 1926. This is an increase of a little over 50,000 in 10 years."

The birth rate in European countries is also rapidly falling. According to Mr. Robert R. Kuczynski [29] "from 1841 to 1885 the birth rate in Europe averaged about 32 per thousand. By 1913 it had fallen to 24 and in 1927 to 18 only." Recent population history suggests therefore a careful revision of population estimates before proceeding with the development of new reclamation projects.

If the assumption regarding population growth is invalid it follows that the assumed need for an additional 40,000,000 acres of crop land is also likely to be invalid. Even if population were to expand to 150,000,000 in 1950 and 40,000,000 additional acres of crop land were needed over that required in 1920 they could be had from three sources other than reclamation. In the first place, 20,000,000 acres of land formerly used for growing the feed crops consumed by the horses displaced since 1920 by tractors and more efficient machinery have become available for the production of human foodstuffs. The other 20,000,000 crop acres could be had by plowing up some of the pasture in farms and by utilizing a part of the 25,000,000 acres of idle crop land. Since 1920 the prices of fertilizers have fallen greatly, making it possible to utilize more effectively the existing areas of crop land without increasing the unit cost of crop production. For this additional reason considerably less than 40,000,000 additional acres of crop land may be needed by 1950.

[24] "Columbia Basin Project," B. E. Hayden and George Severance. Unnumbered publication, 1928, United States Department of the Interior, p. 60.

[25] "A Study of the Market for Products of the Proposed Columbia Basin Project," Chester C. Hampson, Published by the Department of Conservation and Development of the State of Washington, p. 56.

[26] See also "The Utilization of Our Lands for Crops, Pasture and Forests," L. C. Gray, *et. al.*, Yearbook, United States Department of Agriculture, 1923, p. 415.

[27] "Statistical Survey of Education, 1925–26," Frank M. Phillips, Bureau of Education Bulletin, 1928, No. 12, p. 6.

[28] *Ibid.*, p. 5.

[29] "The World's Population," *Foreign Affairs*, October, 1928.

### SOUTHERN LAND RECLAMATION

It has been proposed recently to extend the "benefits" of Western reclamation to the Southern States through the medium of "planned group settlement."[30] It is assumed the difficulties agriculture in the Old South finds itself in are due primarily to the failure to organize farms on a proper basis and that this could be demonstrated by establishing "model rural communities to demonstrate methods of reclamation and the benefits of planned rural development." The model rural communities would each consist of 200 small farms cleared and equipped with buildings and other necessary equipment. Not to exceed 40 years (which means not less than 40 years) would be given for repayment of the purchase price of the farms. Interest at the rate of 4 per cent would be charged. Each of the communities would be closely supervised. The administration of the experiments would be in the hands of the Bureau of Reclamation of the United States Department of the Interior. It is the thought of the Bureau of Reclamation that much of the land which would otherwise become or remain submarginal might be retained for agricultural use.

It is the view of many agricultural economists that the solution to the Southern agricultural problem lies in other directions. Southern farms in many places are already small, in fact too small to yield satisfactory incomes. Furthermore, the states in coöperation with the Federal Government are now providing supervision through county agents and other extension workers. It should be frankly recognized that American agriculture is in a state of flux and that certain sections which were suitable for farming when agriculture was in the self-sufficing stage, before the original soil fertility was lost and before the advent of the boll weevil, may not be adapted to modern agricultural use.

### DIFFERENTIATION OF AGRICULTURAL AND NON-AGRICULTURAL LAND

It is the prevailing view among land economists that a thoroughgoing solution of the land problem in regions where considerable numbers of farms seem to be near the margin of economic use lies, first, in differentiating those soil and topographic types which are likely to remain or become sub-marginal within the predictable future from those which are likely to become or remain supra-marginal. After such differentiation is made the next step is to develop plans for the use of each type. The preliminary results of such studies[31] indicate that in most of the

[30] The more important publications covering this movement are:

(a) House Bill 8221, 70th Congress, 1st Session.
(b) Senate Bill 2015, 70th Congress, 1st Session.
(c) Hearings on H. R. 8221, 70th Congress, 1st Session.
(d) Hearings on S. 2015, 70th Congress, 1st Session.
(e) Proceedings of the Forestry, Reclamation, and Home-Making Conference, New Orleans, La., Senate Document No. 120, 68th Congress, 1st Session.
(f) Proceedings of the Southern Reclamation Conference, Washington, D. C., Senate Document No. 45, 70th Congress, 1st Session.
(g) Reclamation and Rural Development in the South, House Document No. 765 (in two parts), 69th Congress, 2d Session.
(h) New Reclamation Era.
(i) Annual Reports of the Secretary of the Interior, 1926, 1927, 1928.
(j) "Economic Problems of Reclamation," Alvin Johnson and E. C. Branson, with foreword by Elwood Mead. Unnumbered publication, United States Department of the Interior, 1928.

[31] "The Issues Involved in the Readjustment of Farm Organization in the Cotton Belt with Spe-

Eastern States the submarginal lands should be utilized for forestry. Where forest growth does not regenerate spontaneously the land may even be sub-marginal for forestry also. The agricultural program for the farms in the supra-marginal areas will ordinarily involve their reorganization on a larger scale so as to take advantage of modern agricultural machinery. Such reorganization will usually result in the migration of a part of the population from the areas, either into industry or into other supra-marginal farming regions. As a matter of fact this migration will be a prerequisite to the reorganization on the larger basis. This transition is recognized as a wholesome movement. It will result in a smaller population but in a population with higher standards of living, which in turn make for a more wholesome community life.

Fundamental studies providing the basis for this type of rural regional planning are either under way or proposed for the following states: Wisconsin, Michigan, Georgia, West Virginia, Pennsylvania, Kentucky, New York, Connecticut, and Vermont. The demand for these studies originates within the states themselves and are conducted ordinarily by the State Agricultural Experiment Stations, frequently however with the coöperation of the Bureau of Agricultural Economics of the United States Department of Agriculture. The agricultural depression has emphasized the need for the present program of research in land utilization which the Experiment Stations and the United States Department of Agriculture have under way. It has become obvious in recent years that shifts in our agriculture are taking place which seem clearly to be of more than a temporary character. The Experiment Stations and the Department are attempting to forecast the changes that seem inevitable and are offering through their various agencies, particularly the extension services, the public guidance needed to minimize the frictional elements involved in the period of transition.

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cial Reference to the Southeastern States," J. D. Pope; "Results of a Regional Replanning Study in the Mountains of West Virginia as Illustrative of the Scope, Methods, and Practical Results of Such Studies," Millard Peck and Paul Eke. These papers were read at the nineteenth annual meeting of the American Farm Economic Association at Chicago, Ill., December, 1928.

# The Futility of Further Development of Irrigation Projects

By Frank P. Willits

Formerly Secretary of Agriculture, Commonwealth of Pennsylvania

THE agricultural industry of the United States has been held before the public eye almost continuously for the past several years. It has been suffering from a depression which began to be felt after the World War, and which continues today, though in a somewhat milder form, with the evils of overproduction still operating. In spite of this lack of balance between the production and consumption of agricultural products, there are those who feel that we cannot afford not to irrigate. Irrigation at best is a most expensive practice, and further development of it at this time would greatly increase the country's already over-abundant supply of agricultural products and would tend to burden the agricultural industry further.

Before taking up the problems of irrigation, it is necessary to consider the existing condition of agriculture. For this reason, the present situation in the agricultural industry will necessarily be discussed first, so that an understanding of its serious condition may be realized.

## The Status of Agriculture

Some startling changes have recently taken place in American agriculture. It has been said that the nine years since the World War constitute one of the most extraordinary periods in its history. Never before have statistics shown a contraction in the agricultural area. Yet, despite the decrease in crop land acreage between 1919 and 1924, it appears that at no time since 1900 has agricultural production increased at so rapid a rate as in these years since the World War. Along with this, there was also a decrease in the number of farm animals, in the number of farms, in the farm population, and in the prices of many farm products.

Apparently, the introduction of the automobile and the tractor, with associated machinery, and the influences exerted by the various agencies for the promotion of agriculture—the agricultural press, the farm organizations, the agricultural colleges, extension services and experiment stations, the State departments of agriculture, the United States Department of Agriculture, and other organizations—supported by stern economic necessity, have led to the adoption of improved agricultural practices more widely than in any previous period. These years since the World War may be characterized briefly as a period of accelerated mechanization of agriculture and of increasing efficiency of production.

The increase in the total production of the crops (for stock feed, human food, and industrial uses) was nearly 5 per cent. . . . As total crop acreage decreased slightly, it might appear that a notable increase in acre yields occurred. A statistical study, however, indicates that about two-thirds of this increase in crop production is owing to a shift from the less productive crops per acre toward the more productive. A decrease occurred in the acreage of wheat, as in all cereals, and in the non-leguminous hay crops, whereas the acreage of cotton, alfalfa, clover, fruits, and vegetables increased notably.[1]

[1] O. E. Baker, "Land Use Changes Point to Lessening Need for Expansion," *Yearbook*, U. S. D. A., 1927, pp. 413–14.

### FARM ACREAGE

The situation with reference to farm acreage reveals that, until 1920, farm acreage followed continually an upward trend, but since then the movement, on the whole, has been in the opposite direction. For instance, from 1850 to 1920, the acreage of all land in farms more than trebled, and that of improved land more than quadrupled. The period, 1910–20, which includes the war period, indicated a considerable lowering of the margin of cultivation, and the addition of large acreages to the agricultural area,—even a great deal of woodland and other unimproved land was put into higher uses and classified as improved land. With the post-war decline in demand for agricultural products, accompanied by low prices, there was a downward trend in the acreage of agricultural land.[2]

Between 1919 and 1924, for the United States as a whole, there was a decline in the acreage of crop land harvested from about 363 to 344 millions—or about 5 per cent.[3] The greatest reduction took place in those crops that had expanded most during the war period. For example, the crop acreage of wheat declined 30.4 per cent from 1919 to 1924; rye declined 51.2 per cent, and all hay crops, 9.2 per cent.

### VOLUME OF AGRICULTURAL PRODUCTION

As mentioned before, notwithstanding this decrease in acreage of crop land harvested, the volume of agricultural production has continued to increase, and prices, compared with other commodities, remained at low levels. Rough index numbers prepared by Perlman of the physical volume of production of the principal crops, by decades, since 1849, show a rapid rise from one decade to the next, with the figure for 1919 nearly five and a half times as large as that for 1849. . . . The same story is told by the index numbers of physical volume of production when the years 1909–26 are taken.[4] As a matter of fact, during the period between 1910 and 1920, there was also a reduction of farm population, but even this failed to affect the considerable increase which appeared in the physical volume of production of crops and animal husbandry. Likewise, after 1920, when farm population decreased enormously and there was a large shrinkage of agricultural acreage, the physical volume of production of crops maintained the high point reached during the war period.

A few figures for the important food crops, cotton and tobacco, have been prepared which also show the gains in production,—but on a five-year average basis for the periods, 1906–10 and 1920–24. "Wheat production in the United States increased on a five-year average (1906–10) from 633 million bushels to an average of 802 million bushels in 1920–24. . . . The average production of corn during the same period increased almost 500 million bushels; the production of oats, 400 million bushels, and the output of potatoes increased from an average production of 238 million bushels to an average of 396 million bushels. The production of cotton during this period increased one and one-half million bales. The output of hay, in spite of the substitution of tractors and automobiles for horses and mules, and the consequent reduction of demand, increased from 58 million tons to 90 million tons. The

[2] Jacob Perlman, "Recent Recessions of Farm Population and Farm Land," *Journal of Land and Public Utility Economics*, February, 1928, pp. 51–2.

[3] Quoted by Perlman from O. E. Baker, "Changes in the Utility of Land in the United States, 1919–24." A preliminary report, published by the U. S. D. A., June, 1926, p. 3.

[4] Perlman, *op. cit.*, p. 55.

production of tobacco, for the five year period, increased from 750 million pounds (1906–10), to 1,285 million pounds (1920–24).[5]

## NUMBER OF FARMS AND FARM POPULATION

In spite of this gain in agricultural productivity, there has been a decline in the number of farms and in the farm population.[6] Available data indicate that relatively the farm population has been decreasing for more than 100 years, while, absolutely, it began to contract about 1910. The above table of the number and percentage of persons gainfully employed in agriculture and in other occupations at the end of each census year, and taken from Perlman's study, shows the diminution in the agricultural workers which bears a close relationship to the situation in regard to the farm population.

This table shows that there has been a reduction of nearly 800,000 in the gainfully employed workers in agriculture in the decade 1910–20. Accompanying this, there was a decrease in farm population. According to the Census,[7] the farm population in 1920 was 31,614,269. In 1910, Truesdell[9] estimated it at 32,076,960. This was a decrease of 462,691, or 1.4 per cent during the decade. "The percentage of farm population in the total population also decreased from 34.9 in 1910 to 29.9 in 1920, owing partly to the reduction in farm population, but largely to the considerable increase in the total population.[10] Since 1920, however, the de-

TABLE I—PER CENT AND NUMBER OF PERSONS GAINFULLY EMPLOYED IN AGRICULTURE AND OTHER OCCUPATIONS AT EACH CENSUS YEAR, 1820–1920[8]

| Year | Per Cent of Persons Gainfully Employed | | | Number of Persons Gainfully Employed (Thousands) | | |
|---|---|---|---|---|---|---|
| | All Occupations | Agriculture | Other Occupations | All Occupations | Agriculture | Other Occupations |
| 1920 | 100.0 | 26.1 | 73.9 | 41,854 | 10,923 | 30,931 |
| 1910 | 100.0 | 31.2 | 68.8 | 37,454 | 11,704 | 25,750 |
| 1900 | 100.0 | 36.8 | 63.2 | 29,073 | 10,699 | 18,374 |
| 1890 | 100.0 | 41.9 | 58.1 | 23,319 | 9,770 | 13,549 |
| 1880 | 100.0 | 48.9 | 51.1 | 17,390 | 8,505 | 8,885 |
| 1870 | 100.0 | 53.4 | 46.6 | 12,927 | 6,904 | 6,023 |
| 1860 | 100.0 | 59.7 | 40.3 | 10,531 | 6,287 | 4,244 |
| 1850 | 100.0 | 64.5 | 35.5 | 7,697 | 4,965 | 2,732 |
| 1840 | 100.0 | 68.6 | 31.4 | 5,420 | 3,718 | 1,702 |
| 1830 | 100.0 | 70.4 | 29.6 | 3,940 | 2,773 | 1,167 |
| 1820 | 100.0 | 71.9 | 28.1 | 2,881 | 2,071 | 810 |

[5] E. S. Mead and Bernhard Ostrolenk, *Harvey Baum*, University of Pennsylvania Press, Philadelphia, 1928, pp. 72–3. Figures were compiled from the U. S. D. A. *Yearbooks*, 1920–1924.

[6] "Farm population," as defined by the Bureau of Census, "included all persons actually living on farms, without regard to occupation, and also those farm laborers (and their families) who, while not living on a farm, nevertheless live in a strictly rural territory, outside the limits of any village or other incorporated place." It was enumerated for the first time in 1920.

[7] Fourteenth Census, Agriculture, p. 892.

[8] Based on estimates of P. K. Whelpton, "Occupational Groups in the United States, 1820–1920." *Journal of American Statistical Association*, September, 1926, pp. 339–40. Agriculture here is exclusive of lumbering and fishing.

[9] L. E. Truesdell, *Census Monograph VI*, "Farm Population of the United States," 1920, p. 126.

[10] Perlman, *op. cit.*, p. 47.

crease has been even greater, as shown by the 1925 Census of Agriculture figures. On the basis of these figures, Perlman estimates the 1925 farm population at 29,638,000. Compared with 1920, of 31,614,269, there is a reduction of nearly two million in five years,—or at the rate of 400,000 a year. Comparing this with the total population for 1925, we find that the farm population represents 25.9 per cent as against 29.9 per cent for 1920. Of course this drop in percentage is not entirely attributable to the two million reduction, but largely to the fact that the increase in the total population of the country in this period was nearly nine millions. Since 1925, however, the decline has been even more accelerated than before,—the estimate for 1927 farm population being about twenty-eight million.[11] This condition is not to be attributed exclusively to the unfortunate agricultural situation due to the post-war depression. Rather, it is to be viewed as being largely a product of natural conditions which are quite compatible with the industry's progress and prosperity. Decline in farm population began in certain states as early as 1880. From 1910 to 1920, a decline took place in a considerable number of states,—so that causes of this condition exist independently of the more recent depression. A certain part of the movement is due to natural long-time adjustment between industry and agriculture,—with the post-war depression aiding in accelerating the normal trend. The mechanization of agricultural processes is releasing labor from the farms and the advance of scientific methods in agriculture is having the same effect in economizing labor, and it is to be expected that these forces, unless offset by a great increase in demand for agricultural production must necessarily affect enormously the ratio between rural and urban population.

Of significance also is the decrease in the number of farms, which the 1925 Census of Agriculture has disclosed for the country as a whole for the first time in the history of America,—a decrease of 76,703, or 1.2 per cent. "Many of the reductions were caused by the tendency in certain parts of the country to increase the size of the farm unit with the greater use of machinery, but in a majority of cases the decreases were no doubt the result of abandonment of farms, through foreclosure and other causes, which grew out of the depression of the industry."[12]

### BANKRUPTCY RATE IN AGRICULTURE

An investigation[13] of the bankruptcy rate in agriculture showed it to be much higher than in the pre-war years. While the number of farmers who normally resort to bankruptcy courts is small, an indication of the accumulated effect of the financial condition of agriculture since 1920 is reflected in the significant increase in the past seven years,—an increase which is general in all sections of the United States, but affecting the northwestern states most. For the period 1904–13, there was an average for each 1,000 farms of 0.14 bankruptcy proceedings; for 1917, 0.3. The years 1919–20 dropped back to the pre-war figure, while from June, 1923 to June, 1926, there was an increase to 1.22. The year ending June, 1927, shows a drop to 0.99.

Account must be taken of a time lag between changes in agricultural conditions and their reflection in the rate of farm bankruptcies in interpreting these figures. For example, the low failure rate of 1919–20, a year when farm prices

[11] U. S. D. A. *Yearbook*, 1927, p. 28.

[12] Perlman, *op. cit.*, p. 48.

[13] L. H. Bean, "Bankruptcy Rate in Agriculture Much Higher Than Pre-war," *Yearbook*, U. S. D. A., 1927, pp. 110–13.

had already dropped considerably, undoubtedly reflected the profitable years of 1917–18 and 1918–19. The increase in bankruptcies in 1922–23 and 1923–24 reflected the unusually difficult farm situation of 1920–21, 1921–22, when farm prices were lowest. The reduced number of failures in 1926–27 is a reflection of the improved agricultural earnings in recent years, compared with those of the worst years of the post-war depression. There are two explanations offered for the time lag. The first is that farmers tend to burden themselves in prosperous times by additional property bought outright or mortgaged. Then low prices, which are inadequate to cover the capital charges and interest payments, previously incurred, are generally expected to be only temporary, and therefore both the creditor and debtor are inclined to wait for better times. A second factor is that a more or less extended period of time is required to conclude bankruptcy proceedings.

### Livestock Reduction

Another important item in our agricultural situation which has suffered a reduction in number, but which still has failed to diminish our agricultural surplus, is livestock. Some of the reduction in the South resulted from the competition of the cotton crop, and it may be that crop competition has also been a factor in other parts of the country. According to Mr. O. E. Baker,[14] heavy liquidation of beef cattle and hogs has probably been necessary to meet taxes, debts, interest payments and living expenses. There has also been a large substitution of tractors and automobiles for horses and mules,—particularly on the rich lands of the Corn Belt and the states to the northeast, north and west, where there is a continued concentration of meat and milk production. This means greater production per acre, per head and per unit of feed consumed. In addition, losses from disease will probably continue to diminish, and better feeding, especially the greater use of legumes, will become widespread. More cattle also are likely to be slaughtered at an earlier age, thus increasing the production per unit of feed consumed; the quality of the farm animals will probably continue to improve. All these things increase production without increasing the acreage required to feed the livestock.

"Since 70 per cent of the crop land and all the vast acreage of pasture in the United States are used to feed livestock, it is evident that the decreasing number of horses and mules, the increasing production of meat and milk per unit of food consumed, is greatly diminishing the need for expanding the agricultural area as population increases." [15]

### Agricultural Efficiency Indexes

Our agricultural efficiency is improving, as noted in rough indexes of an increase in efficiency of those engaged in agriculture. These have been worked out by Mr. Perlman [16] for a number of decades prior to 1920. For example, the number of people supported by one gainful worker in agriculture in 1820 was 4.7, and this had increased to 9.8 in 1920. Also, the ratio of the number of acres of improved land in farms to the number of persons gainfully employed in agriculture changed from 22.8 in 1850 to 46.1 in 1920. This more than doubled in 70 years.

### The Farmer's Income

It is a well-known fact that the majority of farmers in recent years have been failing to make a profitable show-

[14] O. E. Baker, *Yearbook*, U. S. D. A., 1927, p. 416.

[15] *Ibid.*, p. 416.

[16] Perlman, *op. cit.*, p. 54.

ing in their income account from their farming efforts,—which is due, in part, to the existence of a great agricultural surplus which has depressed farm prices. At the same time, there are a few, estimated at "not more than one in eight," who can be described as prosperous and who can make a profit at the present level of prices. Figures prepared by the United States Department of Agriculture [17] show that "the American farmer receives an average return of $790 a year for his own labor, the work of managing the farm, the labor of his family, and the return on his investment; the lowest wage paid in any major occupation; at least 30 per cent below any other wage group, $325 less than the amount he pays his own hired help. The American farmer is working for 15 per cent less than the amount paid the American farmhand."

That the gross value of crop production, and therefore the income to the farmer, is decreasing is shown by a study of income statements of 4,799 farmers in 1926: "A summary statement of the estimated gross value of crop production confirmed a growing conviction among the farmers that 1926 was not so good a year as had been counted on. Production was greater, but prices were so much lower that the estimate of total value was nearly a billion dollars less than the estimate for 1925. . . . Cash income from sales was $9,549,000, or 58.6 per cent of the gross value of all farm production in the year 1926–27. . . . Compared with 1925–26, cash income from sales of 1926–27 was 4.6 per cent less." [18]

Even "in 1924–25, the best year in agriculture since 1919–20, the net income of farmers of the United States after paying interest, rent, taxes and money expenses was $510, which was supplemented by food from the farm valued at $366,—or a total of $876. . . . The average return on capital owned by farm operators in the last six years (1920–26) has been only 1.5 per cent. This average includes the high return of 6.1 per cent earned in 1919–20, one of the most profitable years American agriculture has ever known. Such figures show conclusively that while many of the farmers undoubtedly earn good returns, a large number regularly have no profits at all." [19]

From what has already been said, and even leaving out the question of the development of further irrigation, it must be apparent that anything which adds to our agricultural surplus, with the consequent depressing level of prices, is only making bad matters worse. Certainly the solution to the problem is not burdening the industry with additional acres to be farmed. Already, more than enough has been produced to meet our needs, and this with a relative and lately with an absolute decrease in farm population, in the number of acres under cultivation, in the number of farms, in the number of livestock,—and still with an increase in the average yield of crops.

Turning now to irrigation,—for there are those who insist that we cannot afford not to irrigate,—what are some of the facts?

### THE COSTLINESS OF IRRIGATION

One of the chief considerations in connection with irrigation is its costliness. It is agreed that it costs more to produce crops on irrigated land than it does on good land under rainfall. Paul A. Ewing [20] states:

[17] Quoted by Mead and Ostrolenk, in *Harvey Baum*, pp. 18–19, from the U. S. D. A. *Crops and Markets*, July, 1927, p. 253, Table 8.

[18] S. W. Mendum, "Incomes of Farmers in 1926, as Shown in 4,799 Statements," *Yearbook*, U. S. D. A., 1927, p. 388.

[19] Arthur P. Chew, of U. S. D. A., in article in *The Annalist*, March 19, 1926, p. 405.

[20] Paul A. Ewing, "Irrigation and Its Cost to the Farmer," *Yearbook*, U. S. D. A., 1926, pp. 455–8.

Several seasons must elapse and a multitude of operations must be performed before a new irrigated farm is at its best. That is true of any farm, of course; but there are things to do preceding the actual use of water which are costly in time, strength and money, and which are not necessary to humid climates.

Even after dams and canals, for which the farmer eventually must pay, have provided the means by which water is brought to the land, the stubborn desert shrubs and bushes must be uprooted and removed, the fields must be leveled so that the water may be sent to every part of them, and farm ditches and irrigation structures must be installed to effect that distribution. Special tools and apparatus must be bought or made with which to do these things. The operations themselves are tedious and must be done carefully at the very start if later exasperation and expense are to be avoided. Moreover, the periodic application of the water to the growing crops is not automatic. When the farmer's turn for water has come, he must take it or lose it altogether. Often he must do the work at night. When it is remembered that he has also to cultivate his fields and harvest his crops as does any other farmer, it will be realized that irrigation is not at all a cheap and easy mode of farming.

## CREDIT REQUIREMENTS AND THE ABILITY OF THE FARMER TO PAY

Credit requirements of irrigation farming are such that not infrequently the irrigation farmer finds himself paying out of his gross receipts a larger sum annually as interest on borrowed capital than he pays for the hire of labor. The interest rate he must pay is very greatly influenced by the degree of confidence that is felt by the lender in the permanence or continuity of the farming business, and this in turn rests very largely on the question as to the sustained productivity of the land.[21]

The ability of the farmer to continue to pay his irrigation charges is becoming doubtful in the case of the Rio Grande project. It is said that the "lower charges for the first six years have been met without any great sacrifice, but the size of the payment required for the last 14 years will constitute a serious handicap unless the prices of agricultural products increase."[22] That this difficulty of meeting payments is not alone a problem of the Rio Grande project may be realized when we hear the Government's side of the story. During the five-year period from 1920–24 inclusive, on one-third of the Federal Reclamation projects, there has been a progressive falling off in payments due the Government from water users. Delinquencies on all projects for this brief period amounted to the staggering total of $8,652,000. In 1924, it increased over $3,000,000.[23]

A later report states that in "a period of 26 years on an investment of $225,000,000, the Federal Government has shown a loss of 6 per cent."[24]

A glance at some irrigation farm figures compiled before the war does not reveal a very prosperous state of affairs. For illustration, the United States Reclamation Service found that the average 40-acre irrigated farm involved an invested cost of money and labor of about $10,000. The Department of Agriculture studied 69 farms (averaging 50 acres each) in Utah—old and established enterprises—and found that the average investment was about $175 per acre (about $9,000). The gross receipts were a little under $1,500 a year for each farm. Cash expenses averaged about $600, leaving the farmer

[21] Carl S. Scofield, *Yearbook*, U. S. D. A., 1927, pp. 396–7.

[22] Arthur Walker and A. S. Curry, "Status of Land and Capital in Elephant Butte Irrigation District," *Journal of Land and Public Utility Economics*, February, 1928, p. 83.

[23] 25th Annual Report of U. S. Reclamation Service, 1925, p. 4.

[24] Quoted by M. N. Dana, in *Nation's Business*, October, 1928, p. 40, from statement of Elwood Mead, Commissioner of Bureau of Reclamation.

$900 to cover his own work and the interest on a $9,000 investment. Of course, there are conspicuous cases of success in irrigation operations, especially among fruit growers, but for a general farming proposition, irrigation offers the average farmer little more than a living for his labor.

### FEDERAL EXPENDITURES FOR IRRIGATION

Congress has appropriated the sum of $15,669,000 for the United States Bureau of Reclamation for the fiscal year ending June 30, 1929, which is made up of the following:[25]

| | |
|---|---|
| Total direct appropriation.... | $12,759,000.00 |
| Estimated unexpended balance | 2,120,000.00 |
| Estimated contributed fund .. | 600,000.00 |
| Power revenues..... | 190,000.00 |
| Grand total available ..... | $15,669,000.00 |

An illustration of what it costs to build a large federal irrigation project[26] may be found in a brief discussion of the Elephant Butte Dam (New Mexico), one of the largest irrigation structures in the United States. The preliminary work before actual construction on the dam itself was started required a period of seven or eight years. The dam itself required about five years for completion, and the total expenditure for the project was over $5,000,000. To add further to this expense, after the irrigation system was placed in operation, many of the lands became water-logged and arrangements for drainage facilities had to be made.

### SOME IRRIGATION OPERATORS' PROBLEMS

Besides costly drainage facilities, there is often the difficulty of keeping canals open in regions where the water is heavily charged with silt. This silt reduces the capacity of the canals and makes constant dredging necessary. The cost of removing the annual silt deposit in the canals and ditches of the Imperial Valley, supplied by the Colorado River, amounts close to a million and a half dollars.[27] On a mileage basis, the cost of keeping the channels open varies from $50 to $60.[28]

The farmer in the region of the Elephant Butte project has a slightly different problem to contend with. He has the expense incurred through the damage done by gophers. These animals burrow through the ditches and canal banks, and cause thousands of dollars loss annually by wasting water, flooding crops and necessitating large expenditures for repairs.

Besides water-logging, which has already been mentioned, the irrigation farmer has soil troubles in the form of salinity and impermeability, which may occur separately or in combination on irrigated land, and constitute probably the chief menace to the permanence of irrigation agriculture, insofar as such permanence depends upon the sustained productivity of the soil.

### CROP RESULTS FOR 1924

The classification of crop results for 1924 by the Bureau of Reclamation does not make any remarkable showing for irrigation.[29]

[25] *Engineering and Contracting*, May, 1928, p. 264.

[26] Arthur Walker and A. S. Curry, *op. cit.*, pp. 77–8.

[27] James H. Gordon, "The Colorado River Situation," *Monthly Weather Review*, June, 1928, p. 212.

[28] H. T. Cory, paper 1270, *Transactions of American Society of Civil Engineers*, Vol. 76, 1913, p. 1285.

[29] 25th Annual Report of Commissioner of Reclamation, 1925, p. 3. "Poor" means a crop yield on a farm less than ½ the average for the project as a whole; "fair"—a yield ½ the average, but less than the average for project; "good"—a yield equal to the average, but less than 1½ times the average; "excellent"—a yield 1½ or more times the average of the project.

| *Classification* | *Per Cent* |
|---|---|
| Poor | 17.8 |
| Fair | 41.5 |
| Good | 30.8 |
| Excellent | 9.9 |

## EXTENT OF UTILIZATION OF IRRIGABLE AREA

If irrigation on the whole has been an attractively paying proposition, it is likely that the present facilities would have been more fully utilized. There is a large potential source of irrigable country, which is already covered by government projects. According to the Commissioner of the Bureau of Reclamation, in 1926, the total area on government projects for which water could be supplied through completed works amounted to 1,844,550 acres. Of this, only 76 per cent or 1,411,020 acres were irrigated, and of this only 1,328,810 acres were cropped. On some of the large projects, like Elephant Butte, which has been completed for more than ten years, there are still many acres which are not being utilized.

If this potential supply of acreage already covered by completed irrigation works were added to our present resources, it would aggravate still further the excess of our agricultural production over our consumption. To develop additional irrigation projects would be detrimental to our country's economic welfare as well as extremely extravagant.

## ARGUMENTS FOR EXPANSION OF IRRIGATION

One of the arguments advanced by an advocate of expanding irrigation for the West states, "If farming comes to a standstill, it will not be of much use to expand industries, and the growth of other nations will mean little to American industries unless we can do our share to feed them." The present prospects hardly indicate that farming will come to a standstill, for the agricultural revolution is on, and the mechanization of the industry is more than keeping pace with the needs of the nation. It has been predicted that the population of the United States will reach a stationary stage of 200 millions near the year 2000 A.D., and the question as to whether or not the agricultural production can continue to keep pace with the increase of population until this point of 200 millions is reached is answered affirmatively on the indications of the available evidence.[30]

Another statement has been made favoring new irrigation projects which seems not to take the present distress into consideration, for it says that "it is impossible to believe that the alfalfa, beans and dairy products of the irrigation projects enter in any material way into the competition with the general farm products of the country. They go a long way toward satisfying local demand, and in making living conditions tolerable where the projects are located."[31] Perhaps they do satisfy local demand and make for more tolerable living conditions, but at a tremendous cost, and at the expense of the rest of the nation, and of the farmers as a whole, and particularly of those who operate the irrigation farms. Certainly, any appreciable addition to the agricultural products which would be sufficient to satisfy the demands of a section of the country, like the West, would aggravate the present situation. It might also be noted that the population on irrigation projects in most cases is rather meagre, and often advertising must be resorted to as a means of attracting people to them. Therefore, why should we add the burden of hav-

[30] O. E. Baker, "Population and Agriculture," *Geographical Review*, July, 1928, p. 363.

[31] M. N. Dana.

ing to make living conditions tolerable in new irrigation places when other better places are still available at lower costs?

A patriotic motive is the basis for another reason advanced for the development of irrigation in the West. In case of an emergency on the Pacific, it says, there is need to be able to supply the West with food. If such an emergency should arise, there would be no problem for the country in meeting it, with the nation's transportation facilities. Certainly this argument does not warrant the development of additional irrigation systems at the present with the attendant high costs of construction and operation, and in the face of an agricultural surplus.

### FUTILITY OF FURTHER IRRIGATION

The futility of further irrigation development is well expressed in a statement by Dr. Isaiah Bowman, Director of the American Geographical Society. He says:

> The total farming population upon the 24 national irrigation projects in the West, after 25 years of government aid and generosity is but 137,000, a population equal to that of the city of Hartford, Conn., or Grand Rapids, Mich. . . . The most trifling improvement of agricultural practice in settled communities will accomplish much more in the production of agricultural products and the growth of population than all the millions that have been poured out upon irrigation projects of the West in a quarter of a century.[32]

Then, too, when we realize that in 1925, some 78 million acres, almost one-fifth of our total crop area, were left unproductive, we must feel the uselessness of adding further irrigation areas. This 78 million acres is "an area which today is part of farms which have been cleared, drained and farmed in the past,—and is in addition to the vast agricultural area of 600 million acres in swamp, forest and desert that forms a potential reservoir of crop production, but which needs a large investment for its development. The 78 million acres is land ready for the plow." [33] If and when the time comes for increasing our agricultural production, the application of farm capital to this land "ready for the plow" will achieve this end in a less expensive and more satisfactory manner than the development of additional irrigation projects.

[32] Isaiah Bowman, "The Pioneer Fringe," *Foreign Affairs*, Vol. 6, No. 1, October, 1927, p. 61.

[33] Mead and Ostrolenk, *op. cit.*, p. 89. Figures were quoted from the *Yearbook*, U. S. D. A., 1925, p. 1379.

# Relief from Farm Labor Costs

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MUCH is said by farmers concerning what they call high cost of farm labor. The matter is usually one of wages farm hands demand and which farmers feel they cannot afford to pay. With this complaint are coupled others, such as criticism of labor as increasingly incompetent, of labor scarcity (including the passing out of the "old-time hired hand"), and of the movement to the cities of classes which once furnished farm laborers.

Farm labor problems are not confined to any one part of this country, nor to any single nation. Canada, England, France, Germany—each have their characteristic problems among which high costs and labor scarcity appear. Even some Far Eastern countries have similar labor troubles.

Nor are farm labor problems new. Writings left by those of past generations read strikingly like those of today. Scarcity of agricultural labor fostered the importation of indentured whites and enslaved Negroes in colonial times. Labor scarcity and costs in general resulted in legislation attempting to control wages.

Later scarcity for generations encouraged unrestricted immigration of laboring classes into the United States. The new country was land-poor. Farm laborers could and soon did become land owners and operators, themselves increasing the demand for laborers to hire. Man power on the land then largely determined acreage cultivated and production accomplished.

## Economic Causes of Farm Labor Troubles

There are now certain important differences in the agricultural and farm labor situations compared with a generation ago.

All the farm lands of present economic value, and even more, have been occupied. Farm laborers can no longer look forward to attaining farm ownership so easily as previously.

Again, much of American agriculture has been revolutionized in the past 75 years: first, by the development and application of horse-drawn machinery; and second, by the addition of motor to animal power. Each step was accompanied by use of larger and more efficient machinery adapted to the power used.

These steps have been accompanied on the whole by increased acreage handled per worker. Since the end of expansion into new agricultural land, there has also been decreased demand for some classes of labor. But in contrast, there has been an increasing call for skilled labor to handle machinery, and to produce crops and livestock under more scientific methods, and to prepare farm products for market.

One-time farm workers can now leave agriculture for other occupations far more easily than in earlier years. Supply of farm labor in this country varies distinctly inversely to industrial activity.

Farm labor problems differ somewhat with the locality, time, type of agriculture, and character of laborers available. There are many resemblances, but the actual problems of New England are quite unlike those of the South and those in turn unlike those of the Pacific Coast States. The solution for one locality cannot be the full solution for another.

The Atlantic Seaboard has general

farming, fruit and truck growing and dairying, much of it intensive. Farm tenancy is low. The agriculture here caters to large urban and industrial populations. Except in the South, the labor supply is mostly white, recruited from the varied populations of the East. Industries are nowhere so distant that their activities or depressions do not affect farm labor supply and wages. Topographical and other conditions often limit largely the usefulness of certain kinds of labor-saving machinery.

The Wheat Belt of the Middle West has an agriculture based upon extensive rather than intensive cultural methods. Grain farming is carried on upon a large scale with increasingly effective mechanical equipment. Under present crop-handling methods the local labor supply must be largely increased at harvest time by bringing in laborers from comparatively distant sources. The growing use of the combine will probably cause a decrease in the peak labor demand.

The Pacific Coast States have another type of agricultural and labor situation. The numerous crops there are frequently grown locally as specialties, often on a large scale. Their peak labor needs occur somewhat in succession through most of the year, but with some overlapping. This situation has seemed to necessitate and has resulted in a large migratory harvest labor force. It is now drawn to a large extent from Mexicans resident in this country and annually from Mexico itself. Question has even been raised as to the feasibility of importing other help.

The farm labor problem has been tied up in recent years with that of agricultural overproduction. Since 1914 American farm workers have increased their efficiency, and agricultural production has gained in amount. The increased volume was at first absorbed under abnormal conditions caused by the recent war. Later it became a distressing surplus which forced retrenchment in production, in farm expenses, and in farm labor forces. A not unnatural cry of farmers caught in this situation has been for cheaper labor, partly to cut farm expenses, partly to lower cost of production in the hope of thereby increasing individual profits.

### THE FARMERS AND FARM HANDS WHO COMPLAIN

There may be said to be three classes of farmers complaining about the high costs of labor.

The first class includes those bound to have their labor troubles accentuated by their farming systems. They include the part-time employers of seasonal and casual labor, poor managers of farm enterprises, and small farmers. Their labor problems can be solved partly by improvement in their farm management methods.

The second class includes farmers who ordinarily complain less. Their enterprises are temporarily hit by economic changes beyond their control. They are all-year employers, the more successful managers, and those able to handle labor both from standpoint of business efficiency and from personal relations. Their labor problems cannot be wholly worked out independently of change in economic conditions for their types of agriculture.

The third group of complainers do not have the ability to get along well with help, either in personal relations, or in leading and directing labor efficiently. But for these serious handicaps they would fall into one of the previous classes.

Farm laborers, as well as farm operators, often have their complaints. They say that farm wages are lower

than they can get elsewhere; that farm perquisites, such as board, lodging, tenant houses, and farm products allowed are poor or insufficient; that personal relations with their employers are poor; that the laborers' social status is low, and social life is limited by farm isolation. Above all, seasonal irregularity of employment is blamed for forcing many men into other industries where unemployment is less severe.

## CAUSES OF HIGH FARM LABOR COSTS

Following the beginning of the World War, farm wages in this country rose from an index point of 101 in 1914 to 239 in 1920, receded to 146, and rose to 170 in 1927. In the same time, the general wage level climbed from 100 to 222, slumped to only 197, and since has more than regained its loss. This fact explains in part the powerful attraction of non-agricultural wages to dissatisfied farm workers. They, like most others, want to follow the dollar.

The index numbers of prices received for all farm products rose from 102 in 1914 to 209 in 1919; it fell to 116 in 1921, and was 131 in 1927. Again, the index of prices for commodities bought by farmers was 101 in 1914, 206 in 1920, 152 in 1922, from which it has risen but little. Farmers' earnings have not risen as have industrial wages and prices of commodities farmers must buy. Consequently they have been able to meet only part way the competition of non-agricultural wages.

In addition, people leaving the farms seek shorter hours, more agreeable tasks and working conditions, steadier employment, enlarged opportunities for social life, better facilities in housing.

There are some added factors of high farm labor costs more or less consequent upon the foregoing. Agriculture's largely seasonal nature makes for seasonal changes in labor forces. The resultant labor turnover makes necessary periodical hunts for new labor forces. These are costly in time spent procuring help, and often in teaching new workers their farm duties. Seasonal labor is more costly per day than year-round labor. It fills peak labor needs, and demands higher wages while working. The former must earn to save for times of unemployment; the latter supposedly has little such risk.

Distinct from these factors are others more dependent upon the individual farm employer.

First and foremost is probably the habit of farmers of demanding labor to work cheaply. The result is labor that demonstrates its cheapness in its inefficiency in, and ignorance of, farming methods, heedlessness in care of animals and machinery, and lack of interest.

Another factor, hired child labor, is often productive of high labor costs. Such labor is often high in ultimate cost because of its carelessness and wastefulness, inclination to play, lack of experience and ability, interference with the work of nearby adults, and its need of constant adult supervision. Of less direct effect are the breaking down of child health by too long or hard work, and the interruption of child education and training for adult life by interruption of education.

## DIFFICULTIES HINDERING A SOLUTION

There are some considerations which make difficult the solving of problems of high farm labor costs.

There are periods when many of the most successful farm managers have hard times making ends meet, because of economic conditions beyond their control, and even beyond their understanding.

There are also those farms which are marginal or even so non-profitable that

their operators can make only a poor living at the best, even in years of reasonable prosperity for the majority of farms in their regions.

The difficulty may go even further. Farming of a given type once prosperous in one section may be hard pressed economically by the development of the same industry in another section of the country where production costs are lower. This seems to be the present situation of some of the Southeastern Cotton Belt since the spread of cotton growing into the Southwest. Similarly, cheap Western prairie grain forced the Northeastern States to abandon much of their grain production years ago.

### AIDS IN SOLVING FARM LABOR COSTS

In solving the high costs of farm labor there are two considerations to be taken into account,—the nonpersonal and the personal.

Increase in labor efficiency can be brought about by various measures.

The Taylor System started this activity in American industry. Europeans seized upon it and expanded it into Rationalization. This not only aims to secure maximum efficiency of labor with minimum of effort, but to standardize farm equipment, to eliminate waste, and to simplify marketing. Europe has to some extent applied rationalization to agriculture in an organized manner. America has studied labor efficiency less formally, but probably none the less effectively thus far for her conditions. There is still much to be done.

Farms can frequently be reorganized for more economical use of labor by improvement of the layout of buildings and of fields for the more efficient use of man labor, of teams, and of machinery.

Better daily planning of farm tasks can secure uninterrupted work of men and equipment. Better planning of seasonal work to allow as full time as possible on productive work at the most advantageous seasons can also help reduce labor costs.

The use of labor-saving equipment on farms has been given due consideration by many farmers; others need to give it more when feasible. Machinery has its limitations on many farms and in many districts because of topography, size and character of farm enterprise, and ability of available farm labor to handle it, and cost.

Higher producing units of crops and livestock are economically more profitable despite some added costs of production than are lower producing units. The 10,000-pound cow produces milk decidedly more cheaply per quart than does her 5,000-pound sister. Ton pig litters were uncommon not so long ago. The two-ton litter has now been achieved. Quick flesh gains mean less feed consumed and less care needed per pound of growth. The 200-egg hen is no longer a practical impossibility compared to her five-dozen sister.

Similarly the expenses of crop production can also be cut down by use of selected seeds, such as certified seed potatoes, selected corn, and single variety cotton in a locality.

Production of all superior animal and crop strains necessitates superior skill compared with former farm practices. The aim is to produce not only larger quantity more cheaply, but also superior quality products. These usually meet ready profitable sale when ordinary stuff is glutting the markets.

Study should be given to the comparative costs of farm operations practicable in the farmers' community, and of reports of costs of similar processes in competing localities. Cheapest local methods of obtaining certain results should be adopted. If competing regions can obtain similar results more cheaply, it may necessitate

change in type of farming. It might mean economic disaster to persist in the old.

For instance, a Department of Agriculture report showed a Mid-Western state obtained 25 bushels of corn per acre at an expense of 21.7 man hours and 46.8 horse hours. An adjoining state grew 40 bushels with only 14.5 man hours and 38.4 horse hours. Costs of productions respectively were 85 cents and 45 cents per bushel. Other examples might be cited.

The above example illustrates the difference in effciency of American farm labor in different circumstances, as well as lowered costs brought about by such efficiency. It is of interest also to note that our comparatively highly paid American workers can frequently successfully compete in the foreigners' own home markets with European meat, fruit and grain producers, and even with Oriental rice growers.

Certain personal elements enter into the problem of solving high costs of farm labor. The character of laborers employed has much to do with their labor efficiency. Willingness, ability, and industriousness go far toward making for high performance. Farmers would be better off for refusing to hire labor lacking in these respects. Those who do insist upon them have much less difficulty with hired labor.

Farmers should be cautious about hiring workers bearing no references, and of unknown qualifications and personal integrity. Members in one Western county farm bureau have tried giving to the men they discharge at the close of satisfactory service a card stating that the employer had found the man named competent and reliable. The system would appear worth a trial elsewhere.

Having secured laborers of the proper type, it is up to the farm operator to manage them advantageously.

A wage consistent with ability should be paid. By wage is meant not only cash remuneration, but also payment in kind, such as board, lodging, housing, farm products, and privileges given as perquisites. A bonus may be paid at the end of a season or year to those who have stayed through, or for high performance; for instance, a dairy hand may be given part of the extra receipts for clean milk. Sometimes extra pay may be given for overtime work. Board given to single men should be of good quality, as should also be the farm products given to married men. In the latter case quantity can well be adjusted somewhat to the man's family needs. Lodging or house furnished should be comfortable.

Usually the granting of reasonable perquisites costs less than trying to hold a discontented man or obtaining and breaking in a new one. Perquisites are seen to often fully make up the cash differences between farm and other wages when properly appraised.

Other factors of good management of labor are regularity of farm hours, reasonably good working conditions, assignment so far as possible of tasks agreeable to the laborer, and personally good relations between man and employer.

A farmer must be able to direct his labor efficiently and to have it utilize its time to best advantage. Some farm employers themselves need to become more efficient workers, the better to lead or direct their men.

Interest on the part of the employer in his man's welfare, treatment of the laborer as a human being, due consideration of suggestions he may make concerning the farm work,—these, and others which might be mentioned, have

psychological elements leading to satisfactory relations between farmer and farm hand, and hence to greater labor efficiency and lower costs.

Employment should be made as steady as possible for good men. Good farm management should aim to reduce the necessity for seasonal overturn of labor as much as possible, even to the extent of changing farm operations by adding new work in slack seasons.

## CONCLUSIONS

Fragmentary data available in the Department of Agriculture seem to indicate fairly consistently that the ratios of farm labor expenses to total farm expenses, and to total farm receipts before, during, and since the World War, have not varied significantly for the country as a whole. Farm labor is admittedly more expensive than before the war, but total farm expenses and receipts are higher in practically the same or possibly higher proportions.

Estimates by Department workers tend to show that from 1922 to 1926 total crop production increased while crop acreage decreased slightly, as did labor, but on the whole agricultural production increased about 18 per cent per unit of labor engaged, due partly to more productive livestock and crops, and partly to use of more power on farms.

A hundred years ago seven-eighths of our gainfully occupied population was engaged in agriculture, but now the fraction is about one-quarter. In view of the constantly increasing efficiency of agricultural workers, there is need of less farm population. Cityward movement of part of it is natural and not a calamity. The net result will be nearer a balance between production and consumption of farm products.

The "old-time hired man"—the man who would work from sun to sun for a small wage, who labored mostly with his muscle, who used at most what now seem meagre equipment and few tools,—that man is gone in most parts of the country. A man now must work more with his head to handle modern farm equipment and to practice modern production methods. He is required more and more to exercise judgment and skill. He deserves higher pay and better working conditions that did the old-time farm hand.

Relief to farmers of the high cost of farm labor is probably to be brought about, not so much by reduction of wage bills as by reduction of cost per unit of production by increased efficiency of labor. The program must conform fairly well with the current economic situation to have chance of success.

The problem seems to be not so much relief from farm labor costs heightened in recent years, but to bring about greater labor efficiency than ever before. This seems to be going on steadily, and must go further. The means to this are in the using of high-class labor, treating it well, and studying to increase labor performance by use of most economical equipment and processes. Admittedly no one of these problems is of easy solution.

# Science and the Farmer

By F. D. Farrell
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"THE master's forehead is of more use than his back." Thus spoke an ancient philosopher in an essay on farming. The author was Cato, a Roman statesman who died about two thousand years ago. He was one of the early advocates of using the mind more and the muscles less in agricultural practice. He favored the use of science by the farmer. Even in his day agricultural science was not wholly non-existent. The successful Roman husbandmen followed some sound practices that still are vigorously advocated for the amelioration of agricultural distress in certain districts, the use of leguminous crops for soil improvement among them. Since Cato's time the use of science by the farmer has increased at an accelerated rate. The rate was slow until the middle of the nineteenth century, then much more rapid for fifty years, and then almost incredibly rapid, especially in America. Science now is being applied in farming and in the enterprises associated with farming to an extent that few people appreciate. The vanguard of American agriculture is now essentially scientific in somewhat the same way as the more progressive manufacturing industries are. Its major activities are based upon scientific hypotheses and demonstrated scientific phenomena. Its management requires high technical ability and something of the scientific attitude.

## Crop Immigrants and New Methods

Much of the development that has taken place in the agriculture of America has resulted from the introduction of new crops and crop varieties and the adoption of new farming practices. To make use of a new crop the farmer usually must have the aid of science. One of the most beneficial crop immigrants in this country is alfalfa. It has been grown for centuries in the Mediterranean Basin, but when it was first brought to America it failed here. In 1795 George Washington wrote to Thomas Jefferson admitting that he, like Jefferson, had been unable to make the crop thrive on a Virginia farm. These two great farmers and their contemporaries knew little, perhaps, of alfalfa's intolerance of what is called soil acidity. And they, like everybody else at that time, knew nothing of the symbiotic relations of alfalfa and certain bacteria which must be present in the soil, either naturally or as a result of artificial application, if alfalfa is to thrive. Although alfalfa failed at first in Eastern America it was successfully introduced in the 1850's into California where favorable soil conditions existed naturally as they do throughout most of the area west of the Missouri River. This important crop plant is now grown extensively east of the Missouri where its successful culture depends on the application of scientific principles that were unknown or inadequately understood a century ago.

The introduction of the Crimean type of winter wheat from Russia into Kansas by some Mennonite settlers in 1873 was of vast importance to agriculture. The subsequent improvement of this wheat and the introduction and

development of other varieties of winter wheat and of spring wheat varieties by the Federal Departments of Agriculture in the United States and Canada and by the state and provincial agricultural colleges, must be regarded as among the most significant achievements of science for the benefit of the farmer. The introduction and the breeding of numerous varieties of the sorghums is another important achievement. The significance of new crops, especially in the western half of the United States, is indicated by the fact that in Kansas, a fairly representative plains state, fully 50 per cent of the cultivated land is used for the production of crop plants that have been brought to the United States, or of plant varieties that have been developed here by scientific plant breeding, since the middle of the nineteenth century. The crops named are only a few of many that have been successfully introduced. The development of new methods of tillage, largely by the scientific agencies above mentioned, has been a factor of great importance. Among these methods are the use of the lister and the one-way disk instead of the plow on millions of acres of land and the practice of preparing the seedbed for wheat from one to three months earlier than was formerly the custom. New plant varieties and new methods have given the farmer a command of his environment that was virtually undreamed of a century ago.

### THE SUBJUGATION OF NATURAL ENEMIES

The application of chemistry and biology in the manufacture and use of insecticides and fungicides and the contributions of Pasteur and his successors to our knowledge of pathogenic organisms have enormously benefited the farmer. While the complete control of plant and animal diseases and of insect pests is far from realized, such progress already has been made in this direction that a distinctly notable degree of control is possible in many important instances. The farmer no longer is helpless as he was not very long ago to combat kernel smut of wheat, smut of oats, San Jose scale of apples, cholera in hogs, blackleg, milk fever and Texas fever in cattle, scabies in sheep, the grasshopper, the Hessian fly, the chinch bug and a large number of others of his natural enemies. Partial or complete freedom from the ravages of those named and of many others is now available to the farmer. The enthusiasm with which hundreds of thousands of farmers have adopted control measures accounts for the prevention of losses which formerly amounted to many millions—possibly hundreds of millions—of dollars annually. The reduction or prevention of these losses, of course, increases materially the aggregate volume of agricultural production, and reduces the cost of production.

### IMPROVEMENTS IN ANIMAL HUSBANDRY

The improvements that the use of science has brought about in crop production have their counterparts in animal husbandry. The discovery of the high efficiency of young animals as compared with older ones in the utilization of feed has resulted in the widespread practice of finishing and marketing animals at a much earlier age than formerly. Beef cattle are finished and marketed when one to three years younger than was the custom a generation ago, and pigs are sent to slaughter several months younger than formerly. Coincident with these changes there have been great improvements in breeding practices and in feeding methods. Scientifically balanced rations and the use of mineral supple-

ments have greatly increased the efficiency of meat and wool production. Improvements in methods of utilizing pasture lands and range lands have been an important contributing factor in the same development. The same fundamental principles involving breeding, feeding, and management have been applied effectively in the production of milk and of poultry and eggs. It is reported by Dr. O. E. Baker,[1] of the United States Department of Agriculture, that in the past decade an increase of 4 per cent in the number of dairy cows and heifers has been followed by an increase of 20 per cent in milk production; that 5 per cent fewer cattle have produced 6 per cent more beef and veal; that an increase of about 20 per cent in the production of pork and lard has been obtained without any essential change in the number of brood sows in the country; and that with somewhat fewer sheep in the country about 10 per cent more mutton and lamb are produced. Hens that lay 300 eggs a year each are about as common now as 200-egg hens were twenty-five years ago. The improvements in animal husbandry suggested by these figures have had profound effects upon the farmer and upon the agricultural industry.

## MULTIPLYING INDIVIDUAL CAPACITY

Perhaps the most conspicuous change that agriculture ever has experienced as a result of the application of science is that involving the widespread use of large-scale farm machinery. This change has been more pronounced in America than anywhere else, and it is more common in the central and western states than elsewhere in this country. The tractor, the truck, the multiple-bottom plow, the one-way disk, the milking machine, the power-driven wool clipper, the grain binder, the header, and the combined harvester-thresher are notable examples. In some instances large-scale machinery still is drawn by teams of four, six, ten, or twenty horses or mules, but the use of mechanical power has displaced animal power to such an extent as to release for other purposes 15,000,000 to 20,000,000 acre of land formerly required to produce feed for work stock. The use of these machines multiplies the farmer's individual capacity. It also relieves him of much drudgery and appeals to his intellectual interest. One effect of the use of large-scale machinery in one farming process—wheat harvesting—has been strikingly suggested by Professor H. B. Walker:[2]

> If it had been necessary to harvest the 1926 Kansas wheat crop by the methods of 100 years ago, when the cradle and hand binder were in vogue, it would have required 775,000 harvest hands working 20 days to cut, bind and shock our last year's crop. If Kansas had been called upon to do this titanic task by these ancient methods, it would have required all the male population of the state between the ages of 15 and 60 years, and then, in addition, all the women in the state between the ages of 20 and 37 years would have been necessary to complete a full harvest crew.

Somewhat similar statements could be made truthfully of many other agricultural practices that have been changed by the application of mechanical science. These changes have all been in the direction of multiplying the capacity of the individual farmer.

[1] O. E. Baker, "Population, Food Supply, and American Agriculture," an address delivered before a joint session of the Farm Economics Association and the Rural Section of the American Sociological Society, in Washington, December 29, 1927.

[2] "The Combine—A Factor in Wheat Production." Report of the Kansas State Board of Agriculture for the Quarter Ending March, 1927.

Since 1850, the average area of land cultivated per farm worker in the United States has increased from 12 to 84 acres. In some of the western states where the use of large-scale machinery is the rule, the figures are much higher. For example, the average is 96 acres in Kansas and 103 acres in Nebraska. In other words, the Kansas or Nebraska farm worker cultivates eight times as many acres as did the average American farm worker in 1850.

The following extract from a letter received about two years ago by the present writer from a farmer in Central Kansas (Reno County) will illustrate what the use of large-scale machinery and the practice of scientific methods of soil treatment mean to a typical farm family in the center of the hard winter wheat belt:

> On this farm where the writer has been living for more than 40 years, the first owner and homesteader broke it out, farmed it for nine years and then lost it to the mortgage company because he could not keep up the taxes and the interest on a $400 mortgage. He had three big husky boys to help him. In those days 40 acres of wheat was a large crop for one family to put in and harvest. Ten years later 100 acres was a big crop. Last year our oldest boy had 350 acres of wheat, and so well did he have the idea of early seedbed preparation drilled into him while at the Agricultural College, that he had it all listed last year before the first of July and it averaged 28 bushels per acre, which was a better average by about six bushels than the average for the neighborhood. This year he prepared 600 acres early and this wheat all looks first-class now. But this is not to boast. It is to show that we need not more but better farmers.

The facts cited and the quotations given are only fragments of the large mass of evidence showing the effects of science in increasing agricultural efficiency in this country.

## TRANSFORMING AGRICULTURAL GEOGRAPHY

The increased use of science is one of the major causes of a continuous process of transformation in agricultural geography. New developments in economic and social conditions, and especially in science, turn the balance of forces in favor of a particular agricultural industry in one district or region and against that industry somewhere else. When the great cities came into being in the East and around the Great Lakes, much of the farm land in those regions rose in price, and this factor and others increased the cost of producing agricultural commodities so that there was need for the centers of wheat and meat production to move westward onto newer and cheaper lands. Science promptly responded to the need by supplying improved wheat varieties, new methods of producing wheat and meat on the cheap lands, and new machines for large-scale operation. Our agricultural industries—wheat, meat, fruits, etc.—are highly migratory. Their centers shift, sometimes quite rapidly, in response to changes in basic conditions. The setting up of new centers is aided increasingly by the application of science to production, storage, processing, and transportation. Within the memory of men now living the center of wheat production has moved westward several hundred miles, and it still is moving in the same direction. Within a hundred years the hops industry has moved clear across the country from New York to the Pacific Coast.

The invention of artificial refrigeration for storage and of refrigerator cars for the transportation of perishables, together with the development of successful methods of production in regions remote from the centers of population, has had a tremendous effect on

agricultural geography and on the American dietary as well. People who formerly prospered growing hothouse lettuce near large cities in the Middle West and East have had to go out of the business because they were undersold by other people who had learned to grow better lettuce out of doors in such places as the Imperial Valley of California, 1,500 to 2,000 miles away.

The same kind of thing is happening in the hothouse tomato industry which is finding it increasingly difficult to compete with outdoor growers on the southern borders of the United States and in Mexico. Many of these growers have been helped materially by the work of the United States Department of Agriculture in the breeding of disease-resistant tomato varieties for growing out of doors in southern latitudes. Now that it is feasible to ship fresh milk from Wisconsin to New York and to ship sweet cream from Minneapolis to Miami, some marked readjustments in the dairy industry may be expected. The persistent endeavors of a small group of scientists and progressive California farmers are resulting in the establishment of date production in the United States. The infant American date industry is a growing competitor of date growers in Mesopotamia. American production of rubber is among the imminent possibilities, thanks to the work of scientists and to economic pressure. The instances mentioned indicate something of the effect of the use of science on agricultural geography. The almost innumerable effects produced in this way are an exceedingly important factor in forcing or favoring the rapid readjustments that are a prominent feature of the whole agricultural situation; a feature of profound significance to hundreds of thousands of individual farmers.

## INDUSTRIAL USES FOR FARM WASTES

A comparatively new but increasingly important feature of the agricultural situation, and one that shows rather emphatically the value of science to agriculture, is the growing use, especially in the industries, of what hitherto have been waste products of the farm. Cottonseed was one of the first of such products for which valuable uses were found. Scientific workers have made this former waste product or near-waste product valuable as a source of nitrogenous feeding stuffs, oils, and other valuable materials. Even the hulls of cottonseed are now put to various uses, including the surfacing of golf greens in some instances. Wheat straw is now commonly used in the manufacture of certain grades of paper. The product that remains after the juices have been extracted from sugar cane is used extensively in making valuable building materials. The use of corn stalks in the making of paper and wall materials now promises to become commercially feasible. The tremendous strides that have been made in the past fifty years by the meat packing interests in the use of hair, blood, bones, and other hitherto waste products of the livestock industries are fairly well known to the reading public. The possibilities of using agricultural waste products still more extensively are now engaging the attention of many scientists. As these possibilities are developed we doubtless shall see additional changes in agricultural geography and still further increases in agricultural efficiency.

## SCIENCE AND THE FARMER'S SOCIAL WELFARE

The farmer has by no means limited his use of science to those methods or machines that improve his economic

status. Indeed, in some important instances he has shown a rather striking preference for those products of science whose value to him is more social than economic or for those whose value combines the economic and the social. He has been criticised, usually quite unreasonably, for buying motor cars which he uses for pleasure as well as for business. He is an enthusiastic radio fan. It is probable that as many as 1,500,000 American farms are equipped with radio receiving sets. The fact that farm families show a distinct preference for radio programs that provide the best music, religious talks, drama, and children's entertainment, as well as for agricultural lectures and market and weather reports, shows clearly that the farmer is obtaining much of intellectual and spiritual value from the radio.

Further evidence of his interest in the socially valuable products of science is found in the movement for farm electrification. In a recent survey of 324 electrified farms in 28 Kansas counties, it was found that 100 per cent of the farmers had electric lights in the home, 71 per cent had lights in the barn, 46 per cent lighted their yards electrically, and 35 to 40 per cent had electric lights in their sheds and garages. Electric irons were in use on 89 per cent of the farms, washing machines on 69 per cent, domestic water pumps on 40 per cent, vacuum cleaners on 39 per cent, and electric fans on 28 per cent. The value to the farmer and his family of each of these appliances is essentially social rather than economic. In the same survey it was found that none of such economically valuable articles of electrical equipment as shredders, corn shellers, clippers, hay balers, chick brooders, grain cleaners, wood saws, milking machines, or shop motors was found on as many as 10 per cent of the farms though each of them was used on some of the farms. These facts indicate the existence of a greater rural interest in the socially valuable products of science than is generally appreciated.

## More Mind and Less Muscle

Following Cato's suggestion the American farmer is becoming more a manager and less a hand laborer. He depends more on mind and less on muscle than his predecessors did. His successors will carry the process still further, for, once formed, the habit of using the contributions of science grows at an accelerated rate. Machinery and the processes of nature are the objects of his management. He manages these increasingly, both in gaining his livelihood and in living his life. He uses a machine to cut corn or sorghum plants into small pieces which he places into a silo in such a way as to induce microörganisms by a natural process to convert the material into silage, a valuable feed for livestock. By the use of machinery he treats milk in such a way that through a natural process certain microörganisms convert it into cheese, a valuable food for man. Thus by learning to manage machines and certain natural processes he is becoming more and more an intellectual worker and his dependence on physical strength diminishes accordingly.

## Agricultural Evolution

The application of science to the biological and mechanical enterprises of farming have made possible the utilization of large areas of relatively cheap new lands. This intensifies some of the difficulties of making farming pay on longer settled high-priced lands or even on cheap lands which have been long in agricultural use. Wheat growers in the Plains States can operate profitably on a price basis that is unattractive to farmers farther east.

Similar phenomena occur from time to time in various parts of the country, and in other agricultural industries besides the wheat industry, as the balance of economic forces and of other basic conditions shifts. This accounts for much distress among those farmers against whom the balance turns.

Because of the large increase in the productive capacity of farmers, it is possible for a declining rural population to maintain and at times to exceed the volume of agricultural production necessary to supply the needs of an increasing total population. This encourages the transfer of some of the rural population to urban industries. A part of the population that discontinues farming consists of people who have not found that occupation profitable to themselves. For them the change often follows a distressing experience. But when they quit farming and become urban consumers some benefits accrue to those who remain upon the land. The demand for farm products is not diminished and there are fewer farmers to share the total receipts from the sale of these products.

Largely, but not wholly, as a result of scientific discovery and invention, changes in basic conditions occur frequently and sometimes suddenly. This requires those who are to be successful in agricultural pursuits to make frequent adjustments in their operations. To do this effectively often requires ability of a high order. Farmers who lack the necessary ability are likely to experience hardship. The difficulty is intensified by the fact that the agricultural industry is less effectively organized than most other great industries, either to make the fullest possible use of the contributions of science or to maintain its position among the other industries, with which, in a greater or lesser degree, it must compete.

One of the effects of the increased productive efficiency that has resulted from the use of science is that the American farmer has experienced a marked rise in his standard of living. He now has more physical comforts, more conveniences, more commercial entertainment, more liberty and more leisure than the farmer of any comparable country. As his wants have increased, his expenditures, of course, have mounted until now he spends more for the goods he buys and pays more in taxes, for education and other governmental services, than his grandfather or even his father would have believed to be possible. To keep his wants—and, consequently, his expenditures—down to somewhere near his earning capacity is one of his most difficult problems. To meet his financial obligations he rightly seeks increased aid from science. When he gets it and his earning power increases his standard of living rises still further so that his wants tend to keep ahead of his income, as is true with most of us.

The foregoing observations suggest the fact that American agriculture is involved in a rapid process of evolution. Science unquestionably has been a major factor in bringing about that situation. Whether in agriculture, in manufacturing, in commerce, or in nature, evolution is essentially a competitive process. The plants, animals, industries or men concerned compete either *inter se* or group against group, or in both ways, for "a place in the sun." Those that have or that develop unusual fitness for making favorable adjustments to their environment are advantaged correspondingly in the competition. Inevitably the evolutionary process is a painful one for men or plants or animals that fail for want of the necessary individual or collective action to meet the requirements for survival.

Human society can and does devise helpful procedures for the use of man against his natural competitors. It can and does devise methods for "humanizing" the relations between competing men and groups of men. But it does not and it probably cannot eliminate the necessity for constant struggle for increased individual and collective fitness on the part of those who are to survive economically and socially. No better method has been found for increasing economic and social fitness, in agriculture or in any other occupation, than intelligent use of science.

# Recent Trends Balancing Agriculture in the United States

By W. J. Spillman
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IN *The Annals* for January, 1925, I discussed the problem of balancing the farm output. The purpose of the present article is to restate the problem in the light of events that have occurred and studies that have been made in the last four years.

It is now possible to state the problem more clearly than at that time. It is now realized that the problem has several phases, each of which involves principles and conditions peculiar to itself.

In the first place, it is necessary to consider crop enterprises in two groups, which may be designated the major and the minor crop enterprises.

The major crops are cotton, corn, wheat, oats, and hay. Each of these occupies more than 40 million acres of land. Together they occupy 88 per cent of our total crop area. Amongst the minor crops, barley at present occupies about 12½ million acres, but no other is grown on more than 7 million acres of land. The acreage of all the minor crops taken together is only about equal to the acreage of the smallest of the major crops.

## Major Crops

For reasons that will appear later, we are now producing a surplus of each of the five major crops. The normal production of each of the minor crops is about as great as can be marketed at a satisfactory price. It is obvious, therefore, that under present marketing conditions it is impossible to bring about a balance between production and market demand by adjustment of the acreage of any one of the major crops. Other methods must therefore be sought to enable farmers to secure adequate returns from them. The direction in which efforts with this end in view appear to be most hopeful are coöperative marketing, and business-like handling of crop annual and seasonal surpluses. It now appears certain that Congress will very soon enact legislation with these ends in view. It is probable that a Federal Farm Board will be constituted, with broad powers, and with financial backing from the Government. It will probably be the duty of this board to study every phase of the problem and adopt such measures as appear to be practicable for its solution.

## The Cotton Situation

In recent years there has been as great an unexpected expansion of the cotton area westward and northward. The Census of 1925 revealed the fact that during the preceding five years the area of cotton to the westward of the west line of Louisiana and Arkansas increased 62 per cent. This is a region in which the boll weevil is hardly a factor because of the difficulty it has in propogating where the atmosphere is very dry. At the same time, in the states along the northern border of the cotton belt, from Arkansas to Virginia, and extending northward to southern Illinois, there was an increase in cotton acreage of 30 per cent. The enormous expansion that had occurred, together with the unusually high yield in 1926, resulted that year in an 18

million bale crop. Naturally, the price fell, and it went considerably below cost of production. This fall in prices had two important results. In the first place the extraordinary interest in cotton production in foreign countries, which had been aroused by continued high prices of cotton during and since the war, suddenly ceased. The second result was disaster to cotton growers in our southeastern states, particularly in the lower parts of these states adjacent to the ocean or the Gulf of Mexico, where, because of the dampness of the atmosphere, methods of controlling the boll weevil are not very effective. In the states of South Carolina, Georgia, and Florida, taken together, there was during this five-year period a decrease of 32 per cent in cotton acreage. Since most of the cotton growers in this section have no other alternative as a source of cash income, this meant abandonment of farm land on a large scale. Many important problems must be solved before the agriculture of this section can be completely rehabilitated.

The low prices of cotton in 1920–21 and again in 1926 have temporarily checked the expansion westward and northward. But the possibility of further expansion in these directions still exists, so that apparently the problem of making cotton culture profitable will continue to exist. Dr. Gabbard, of the Texas Experiment Station, who has made a careful study of the situation in his state, reports that there are still 20 million acres of good farm land, with sufficient rainfall to make crop production feasible, devoted to grazing in western Texas. Of the land already in cultivation in this section about 50 per cent of it is in cotton. There is here, then, an additional 10 million acres that may be devoted to cotton when conditions justify bringing it into cultivation. It is also probable that by some attention to breeding and selection for earliness of maturity the northern edge of the cotton belt, where the cold winters hold the boll weevil in subjection, may be extended a distance of 50 miles or more. It would appear, therefore, that efforts to make cotton culture continually profitable will be in order for many years to come.

The cost of producing cotton is materially enhanced by the hand picking methods generally in vogue. There is reason to believe that the problem of the mechanical cotton picker has been solved. If machines for this purpose can be made generally available, and prove to be as satisfactory as some of them appear to be in preliminary trials, the cost of producing cotton, particularly in the larger fields in the central and western portion of the cotton belt, will be materially reduced. This may help to solve the problem. On the other hand, it may make cotton production so profitable in the West that it will lead to still further expansion, resulting in reducing the price to a new low cost level. This would bring further hardship in the eastern portion of the cotton belt, where the fields are small, and where the mechanical picker might not be readily usable.

### THE WHEAT SITUATION

In the former article the possibilities of the expansion of wheat acreage in various countries were pointed out. But the moderate prices for wheat that have prevailed since that time have held production in check fairly well, except in Canada where there has been a notable increase in wheat acreage. The wheat situation is, in fact, little changed from its status four years ago. The events of 1918–19 show that in this country enormous expansion of wheat acreage is possible. Under these conditions it appears probable that future wheat production is capable of such expansion as market conditions

may permit. This should keep prices at a moderate level.

In the case of both cotton and wheat we export a large surplus, and it is the world price that determines prices in this country. Our export of cotton is so enormous that the world price is largely determined by the size of the American crop. But the possibilities of expanding cotton acreage in other countries are sufficient to prevent high prices from extending over any long period.

In the case of wheat, our export is about one-third of the total world export; hence the price of wheat is mainly determined by production in other countries, particularly Canada, Australia, and Argentina.

Such relief as can be obtained for cotton and wheat growers must apparently come from intelligent handling of surplus production in good years, and from regulating the seasonal flow of the crop to market. The tariff on wheat is of some benefit to producers in our northwestern states, where the quality of wheat produced is similar to that in western Canada. Similarly a tariff on long staple cotton might be made of advantage to producers of long staple in this country because we import a considerable quantity of cotton of this character.

### CORN, OATS AND HAY

Two events have occurred in recent years that have an important bearing on the corn situation. One of these is the marked decrease in the number of horses and mules in this country. The decrease since the high point of 1918 is approximately 6 million head. This means the disappearance of the market for approximately 6 million acres of corn, 6 millions of oats, and 8 millions of hay. Before this decrease began, corn acreage appeared to be fairly well adjusted to market conditions. But since it began, the price of corn has fallen considerably and in years of yields above normal we are now confronted with a considerable surplus of this commodity.

The other event is the continual progress of the corn borer toward the heart of the corn belt. Experience with this pest is not yet sufficient to enable us to determine what effect it will have on the corn situation. It has been shown by the entomologists that by destroying all parts of the corn plant which can harbor the borer, sometime between the harvesting of the crop and the transformation of the larva into the mature insect, which occurs in late spring, it is possible to grow corn without material damage from the pest. Much hinges on the methods necessary to adopt in making this cleanup of the debris from the crop.

At least one paper factory has been built in the corn belt for the manufacture of paper from corn stalks. Where the stalks are removed in the fall or during the winter or early spring for delivery to the factory, the cleanup problem will be fairly simple. But where no method of disposal of the corn stalks is available, the farmer will have a great deal of additional labor to do as compared with that formerly required. This will mean on most farms considerable reduction in corn acreage. If this reduction occurs as the corn borer spreads, it should have considerable effect on the price of corn. It is yet too early to predict what the ultimate effect on the corn crop will be. So far as the present situation is concerned, we are still at the point where a crop above the normal results in prices will mean considerable loss to those who grow corn for sale.

The situation with reference to the oat and hay crops has not changed materially in four years except that the decrease in the number of horses has re-

sulted in increasing the surplus of these two crops. There appears to be no possibility of adjusting their acreage to market demand except by the abandonment of farm land.

### WESTWARD SHIFT OF FARMING

Natural causes are operating to reduce the inequality between agriculture and other industries. In the Plains Region, and in much rich territory along their eastern margin, extending into Iowa, southern Minnesota, northern Illinois, and some sections of states further east, the topography is such as to render feasible the use of large labor saving machinery. The introduction of such machinery in this region has gone forward rapidly, with resulting reduction in cost of production on the farm. The large size of farms here has favored this movement. As a result, farmers in this part of the country have been able to hold their own fairly satisfactorily in the face of the low prices that have prevailed for farm products since 1920. But in the eastern parts of the country, especially in the Ohio Valley and southward, both the small size of the average farm and the general roughness of the topography have hindered the introduction of labor-saving machines. As a result, farmers in this region have suffered more from low prices than those to the westward. In consequence there has been much abandonment of farm land. There has thus been a marked shift of agriculture toward regions of low production costs. There has also been some reduction in the total acreage of crops in the country. These movements tend toward balancing the farm output.

### THE MINOR CROPS

In the case of crops other than cotton, corn, wheat, oats, and hay, farmers have always been in the habit of trying to adjust acreage to market demand. The following consideration will show why this is feasible. Our normal acreage of potatoes is approximately 3,750,000 acres. If we should reduce this acreage 10 per cent in any one year, and replace the potatoes with corn, the increase in corn acreage would be only about one-third of 1 per cent. Such a substitution might treble the price of potatoes without having appreciable effect upon the price of corn. The acreage of any minor crop may thus be adjusted, provided those who grow it have sufficient information at the time they are planning their production campaign to enable them to make the adjustment intelligently.

Realizing this situation, the Department of Agriculture, in coöperation with the various state institutions, has in recent years made studies of the acreage of these minor crops required, with normal yields, to meet market demands at prices that are at least fairly satisfactory to growers. Each year the department makes a careful survey of the situation and issues late in January its *Outlook Report*, pointing out where increases are permissible or decreases desirable. A few weeks later the department issues its *Intentions Report*, which shows the increases and decreases in crop acreage contemplated by farmers. These two reports give growers two chances to adjust their acreage with a view to preventing gross oversupply and undersupply of any commodity.

These reports have now been issued each year for four years past. The difficulty hitherto has been to get the information in these reports to all those who should benefit by it. This year the department is paying the expenses of one man from each state to come to Washington to help in formulating the *Outlook Report*, and in formulating plans for giving the *Outlook* and

*Intentions Reports* the widest possible circulation. While much work yet remains to be done before the acreage of all the minor crops can be properly adjusted, it is believed that plans now in preparation will result ultimately in bringing about such adjustment, in so far as it is possible to do so.

### THE LIVESTOCK AND BEEF SITUATION

Our principal livestock products are beef, dairy products, wool and mutton, pork products, and poultry products. Pork products are the only representative of this class produced in quantities considerably larger than are needed for domestic requirements.

About once in thirteen or fourteen years, on the average, we produce so much beef that the price goes below cost of production. Production then falls off rapidly. Following this, for a long period of years there is liquidation in the beef cattle industry, until numbers are again reduced to the point of undersupply. In spite of these fluctuations in prices and production, the quantity of beef at no time rises to the point of extensive exportation. The solution of the cattlemen's problem appears to lie entirely in the direction of stabilizing production. This can only be done by furnishing cattlemen detailed information as to the increase permissible in breeding herds at any given time.

The difficulty is accentuated by the fact that the breeding herd of cattle is so large a proportion of the total cattle population. When we reach a point of overproduction, the number of female animals sent to market for several years previously has been less than normal; they have been kept back for breeding purposes. When liquidation begins, the number of females sent to market increases largely, thus causing precipitous decline in prices. It is further accentuated by the fact that it is three or four years after the number of breeding animals becomes too large before market conditions begin to be seriously affected. Meanwhile, the breeding herds have gone on increasing. By the time it is realized that an excess of production exists, production is at an extremely high level. To correct the difficulty, *Outlook* and *Intentions Reports* with special reference to the beef cattle industry are necessary. To make them effective it will be necessary to obtain more detailed and more accurate information than is now available.

### THE HOG SITUATION

As already stated, we produce a surplus of pork products for export. This surplus is such a large part of world exports that world prices are governed largely by production in this country. Yet Europe has a hog cycle of its own. The farmers of central and northern Europe sometimes produce too much and sometimes too little of pork products. As their surplus is marketed in competition with ours, the price situation is occasionally materially affected by conditions of production in Europe. This is something over which we can naturally have no control. But in so far as price conditions are affected by pork production in the United States, we can have an influence on production and prices. The Department of Agriculture has given much attention to this problem. Twice a year it makes a pig survey, with the coöperation of the Post Office Department, through its rural mail carriers. This survey obtains information concerning the number of pigs produced the preceding year, and the number farmers intend to produce the coming year. It takes into consideration both spring and fall litters. The information obtained in the survey is distributed as widely as possible. There

is evidence that pork producers have begun to give serious attention to this information, and it appears probable that stabilizing of production of pork products may be approximately attained in the not distant future.

### DAIRY PRODUCTS

At present we are producing slightly less than domestic requirements of dairy products. The price of dairy products in general is determined by the price of butter. We have a 12 cent tariff on butter. This permits prices in this country to remain considerably above world prices. In recent years our dairy farmers have been fairly prosperous and we have had no clamor for farm relief from the dairy sections.

Should the effect of the corn borer materially disturb the relations between beef and pork production and dairying in the central corn belt states, resulting in a very material increase in the production of butter, this situation may be greatly changed. The producing power of the corn belt is so great that it might easily put us on an export basis for butter. If that should occur, the price of dairy products in this country would fall below the level of world prices, and we should have distress in those sections of the country where dairying is the leading farm industry. It is to be hoped that this will not occur.

### SHEEP, WOOL AND POULTRY

We still import approximately half of the wool used in our textile industries. The tariff on wool amounts to about 15 cents per pound on raw wool. This large import over a fairly high tariff wall results in very satisfactory prices for wool on American farms. We could apparently make a very material increase in our sheep population without disturbing the price structure.

The poultry situation is similar to the dairy situation. We are producing slightly less than domestic requirements of poultry products. So long as we do this, the price situation should remain satisfactory.

Amongst the animal enterprises, pork production is the only one on which conditions in foreign countries have an important bearing. It is believed that the pig survey may ultimately solve the problem of prices of pork products by adjusting production to market demand in such a way as to result in satisfactory prices.

### CONCLUSION

The Federal Farm Board, which will undoubtedly be appointed in the near future, will have very important duties to perform. In the case of the minor crops, and of various livestock enterprises, the important thing is to aid in making the *Outlook* and *Intentions Reports* more adequate, and in obtaining a wider distribution of the information these reports contain. In the case of the major crops, the board will need to make extensive studies, and should aid in devising plans for orderly marketing and for reducing the cost of distribution. Perhaps the most important service this board can render is in simplifying marketing procedure, reducing the expense of marketing, and thus giving the farmer a larger share of the consumer's dollar, while at the same time reducing the cost to the consumer.

# Diversification of Agriculture—Its Limitations and Its Advantages

By W. E. Grimes

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GREATER diversification of agricultural production frequently has been urged as a means of increasing agricultural income and thereby improving agricultural conditions. Many farmers secure relief in times of agricultural distress by turning to the production of new products or by increasing their production of products that previously were relatively unimportant in their farming operations. Presumably the products, the production of which is increased, are those which are relatively high in price or are those which will fit into a particular farm organization with little additional cash expense.

The advantages of diversification to the individual farmer are numerous and are such as to recommend such a policy to most farmers. However, the extent of these advantages is conditioned by the number of farmers attempting to secure them. Obviously, if any considerable proportion of the total number of farmers made similar changes, the price advantage of the particular product would quickly disappear as a result of an increased supply of that product. Consequently, greater diversification practiced by a few farmers presents opportunities for them, but greater diversification practiced by all or even a majority of all farmers is an entirely different matter. In other words, greater diversification as a policy to be followed by individual farmers is an entirely different matter from an attempt to improve agricultural conditions in general by greater diversification as a national policy applied to the aggregate agricultural production of the nation.

## Purposes of Diversification

Diversification of production, considered from the standpoint of the individual farm, is intended to increase farm income in one or more of the following ways: (1) By increasing the production of those products that are relatively high in price and which offer satisfactory margins above the cost of production, (2) by reducing the cost of producing all products of the farm by distributing fixed costs over a larger quantity of products without materially increasing variable costs, and (3) by securing more of the living of the farmer and his family from the farm by producing for home use those products that are not of major importance in the agriculture of the region but which can be satisfactorily produced in limited quantities.

## Changing to Profitable Products

A situation in which a particular product is more profitable than other farm products commonly grown on the farms of a community frequently exists but rarely continues for any great length of time. For example, hogs and beef cattle in some years have been so high in price that exceptionally satisfactory profits have been secured by the producers of them. These good profits have been attractive to farmers, and increased production has resulted. With increased production prices have declined to levels where profits no longer were possible under usual conditions. The hog and beef cattle price and production cycles are the consequence of farmers' attempts to diversify

their operations by starting to produce those products when they were high in price. In fact, these attempts have sometimes been the cause of agricultural distress. Farmers have moved *en masse* into the production of particular products that were high in price. Time is required to produce farm products. The time required varies with the product from a few months to several years. By the time the new production was ready for market, the supply had been so increased that prices declined. Diversification of this type, in the past, has usually been overdone with disastrous consequences.

The attempt to produce the product that is high in price has much merit, but an entirely new approach to it must be made if satisfactory results are to be secured by the majority of farmers. The work in the forecasting of price and production trends now being done by the United States Department of Agriculture and by many of the state agricultural colleges has for its chief purpose the changing of farmers' response to these conditions. In the past, prices have reached high levels before increased production was started. By forecasting the probable trends in prices and production and making this information available to farmers, it is hoped that a sufficient number of farmers can and will take advantage of it to prevent the decided up and down swings that have been too characteristic of farm production in the past. A better balanced, more stable production should result. It is true that high prices will be less frequent, but low prices also will be less frequent. More farmers suffer from low prices than benefit by high prices. Prices are low because more has been produced, and it is safe to assume that more farmers helped to produce the larger supply than those participating in the production of the limited quantity available when prices are high. Consequently, any change that will result in more stable prices and more certain profits, even though the profits are moderate, will be beneficial to agriculture as a whole.

### LOWERING COSTS BY DIVERSIFICATION

Increasing farm income by reducing costs or by spreading them over a larger quantity of product and thereby reducing costs per unit is probably the greatest advantage to be secured from diversification. Opportunities to take advantage of such conditions are to be found on most farms, and many farmers are now profiting thereby.

In each of the principal agricultural regions of the United States there is usually one farm product that pays better than any other product. In the corn belt, that product is corn; in the wheat belt, it is wheat; in the cotton belt, it is cotton; and so on. These crops make greater returns for the time employed on them than any other products that may be grown in these respective regions. Any diversification that results in a reduction in the quantity of one of these crops grown on a particular farm usually also results in smaller returns for the time and resources that would have been used on that crop. Consequently, the enterprising corn farmer usually wants to grow as much corn, the enterprising wheat farmer as much wheat, and the enterprising cotton farmer as much cotton as he can. Other products are produced on these farms which do not compete with these high profit crops for the use of labor and equipment. In the corn belt, the good farmer grows as large an acreage of corn as he can properly care for, and then adds supplementary enterprises, such as hay and small grain crops and livestock, in such proportions as will use his time and resources when they are not required in corn production. Good farmers in

other regions follow similar practices adapted to their farms. These supplementary enterprises included in the business furnish employment for time and resources when they are not needed for other more important things.

The cost of maintaining machinery, fences, and buildings is a fixed expense, and when these instruments of production are used in producing supplementary products as well as the main crop of the farm this fixed expense is distributed over a larger quantity of product with lower cost per unit produced. The labor of the farmer and of regularly employed help also is of the nature of fixed costs and the supplementary enterprises often return income for this time which adds to the total net income of the farm business.

Diversification is now employed by many farmers in the manner above described. It is resulting in reduced costs and increased incomes. It is also true that there are many other farms that are not practicing these things and which could practice them to advantage.

### Producing Home Used Products

The production of products that are needed for home consumption is practiced by many farmers. Garden products, milk and other dairy products, eggs and poultry, meat, fruit and vegetable crops for use in the farm home are regularly produced on many farms. There is room for further extension of this practice particularly in the regions of one-crop farming.

Diversification of this type does not result in increased cash income but gives income in kind which is often more important than its equivalent in cash income. The products produced and consumed on the farm frequently result in a better balanced dietary than probably would be secured if the products were sold and other articles of food purchased with the proceeds.

The extent to which diversification of this type can relieve general farm distress is limited. Farmers of the United States are now producing and consuming on the farm where grown approximately two-thirds of their food supply.[1] Further extension of this practice would be helpful to those farmers most in need of it, but its aggregate influence in any instance of acute farm distress would probably be relatively small.

### Stabilizing Incomes Through Diversification

A further advantage of diversification is the greater stability of income from year to year on the individual farm producing a diversity of products. This often aids in avoiding debt and makes easier the maintenance of a standard of living from year to year.

The preceding discussion has dealt with some of the advantages of diversification as it applies to the individual farm. The problem of applying such a policy to the agriculture of the nation in times of agricultural distress as a means of relieving the distress and increasing the total agricultural income presents entirely different problems. In the first place, many of the farms of the United States are well diversified and consequently have no opportunity to further increase their incomes in this way, and these farmers feel the pinch of low prices as well as their fellow farmers who could benefit by greater diversification. To this large group of well diversified farms, diversification offers no further relief in times when relief is needed.

### Diversification of National Agricultural Production

From the national viewpoint it may be suggested that some of those prod-

[1] "The Family Living from the Farm," United States Department of Agriculture Bulletin 1338, August, 1925.

ucts now imported might profitably be grown in the United States, thereby giving greater diversification of national agricultural production. These products include wool, hides, sugar, flax, vegetable oils, sub-tropical fruits, and many others of minor importance. If wool production is increased, mutton production will also be increased and, since mutton is usually the more important item, the farmers of the United States have refrained from materially increasing wool production even under fairly high protective tariffs. If sufficient wool were produced to supply the needs of the people of the United States the problem of disposing of the mutton also produced could conceivably present a problem of greater difficulty than any gain secured by producing the wool would offset.

Similarly, the production of more hides would result in more meat, and relative overproduction of meat now frequently constitutes a major agricultural problem as is evidenced by the serious depression in the cattle industry following 1920. Sugar and flax both are protected by tariff duties and yet most farmers have found it better to continue to grow those products that are not protected but for which their soil and climatic conditions are better suited. The same conditions apply to vegetable oils, sub-tropical fruits and other products now imported. Obviously, comparatively little is to be gained by increasing the production of farm products that are now imported.

If all farmers who could profit by greater diversification were to do so, the products produced as a result would give serious competition to the products of other farmers. Many wheat and cotton farmers could profit by greater diversification. For them, greater diversification would mean the production of more hogs, beef cattle, dairy products and poultry and eggs. Increased supplies of these products would often be disastrous to farmers of other regions in which these products are of major importance. Farmers in these other regions could truthfully say that greater production of these products was not needed. A situation of this type of recent occurrence is illustrated by the concern recently expressed by corn belt farmers over the tendency of the farmers in the older cotton growing regions to turn from cotton to corn and hogs. Diversification of agriculture by the farmers of one region, if practiced by many farmers, may result in distress for farmers in other competing regions.

### CAPITAL NEEDS FOR GREATER DIVERSIFICATION

The farmers who need greater diversification of production and who attempt to secure it in times of agricultural distress often find their own plight an impediment to diversification. Their farms are equipped for the production of their major product but are not equipped for the production of the new products involved in diversification. Capital is needed to secure diversification and these farmers probably do not have the needed capital and frequently are not in position to borrow it. Some of them would undoubtedly contend, in good faith, that if they had the needed capital diversification would not be needed. These farmers illustrate a fact that appears to be universally true of regions of agricultural distress, which is, that those in distress are less able to help themselves out of the difficulty than before the situation became acute. The most hopeful solution of all conditions of distress is to prevent their occurrence.

From the national standpoint, the diversification of agricultural production offers comparatively little opportunity for immediate relief from agri-

cultural distress. An individual or a considerable number of farmers may secure relief by diversification but applied in a wholesale way to the nation's agriculture, diversification could easily produce more distress than it could remedy.

## STABILIZATION OF AGRICULTURAL PRODUCTION

If diversification offers but little hope for general relief in times of agricultural distress, the question logically arises as to the things farmers can do to prevent the development of distressed conditions and to ameliorate them when they occur. The answer is in the stabilization of agricultural production.

In the general farming sections of the country many farmers can be found who are equipped to produce hogs, or some other product, each year but who sometimes produce none, at other times produce only one-half as much as their farm is equipped for, and at other times produce to full capacity. For example, there are farmers who are equipped to produce a carload of fat hogs each year. One year no hogs are produced, and the next a carload is produced. The unfortunate part of the situation is that prices are usually high the year that no hogs are produced and low when the carload is produced. The high prices encouraged production and the low prices discouraged it.

It is the purpose of the forecasting work previously described to remedy this situation by encouraging continued steady production at times when the immediate situation appears dark and to discourage headlong rushing into the production of a product when the immediate situation is satisfactory. In the past the tendency to rush in and to rush out of production on the basis of immediately apparent conditions has resulted in cycles of relative over- and under-production of certain farm products which are chiefly but not wholly livestock. By curbing these tendencies, more stable production and more stable prices can be secured. This is true of crops such as potatoes, tobacco, and others, as well as of livestock.

By stabilizing production on individual farms, greater stability of national production can be secured. Complete stability is not possible since some fluctuation results from varying climatic conditions. However, if such stabilization is accomplished as is possible through stabilization of the acreage of crops and the number of livestock on individual farms from year to year, the keen edge can be taken from agricultural surpluses which are so frequently the causes of agricultural distress. It is estimated that 25 to 50 per cent or more of the fluctuation in crop production results from changes in acreage and that 50 to 75 per cent of the difference in number of animals produced is the result of the conscious actions of farmers. Stabilization of production on individual farms would reduce agricultural surpluses in the aggregate by at least one-half and, due to the effects of a surplus on prices, would probably reduce the consequences of surpluses in terms of farm income by much more than this amount.

## DIVERSIFICATION AND STABILIZATION

The stabilization of production is a long time process. Diversification of production on individual farms helps to secure stabilization when too many farms do not attempt greater diversification at the same time. Some diversification is sound business policy for all farms. It leads to greater economy in production by giving fuller use of farm resources.

As farms gradually become better diversified and more stable in their production from year to year, production at less cost can be secured. The farms on which production now fluctuates

radically from time to time are over-equipped on the basis of their average annual production. Some part of their farm plant is under-utilized each year in all probability. The maintenance of this equipment is a fixed charge on the business. More stable production of diversified character should make less equipment necessary and thereby reduce fixed charges and cost per unit of product produced.

## SUMMARY

Diversification of agricultural production as a business policy for individual farmers is always to be commended. It results in lower production costs and more stable and usually larger annual farm incomes. Many farmers of the United States are now practicing diversification of production as an established business policy.

Diversification of agricultural production from a national standpoint has been fairly well accomplished in that there are few farm products not now produced in the United States that could be produced profitably and also few farm products a portion of the supply of which is now imported that could be produced profitably in sufficient additional quantities to eliminate the imports.

As a policy to be adopted on a national scale to relieve agricultural distress, diversification of agricultural production has comparatively little to offer. Changes in production by large groups of farmers would result in unbalanced production and merely transfer distress from one agricultural industry to another. Furthermore, a change to the production of a new product usually requires capital expenditure and those farmers most in need of relief are least able to secure additional capital.

Stabilization of agricultural production offers opportunity for permanent relief by preventing acute surpluses which are frequently a cause of agricultural distress. More stable production involves diversification on individual farms. Stabilization and diversification will both result in lower production costs by reducing equipment requirements and giving fuller utilization of available equipment. This results in greater net income from farming. The opportunities for stabilization are numerous since production on many farms fluctuates much more radically than aggregate annual production and the fluctuations in total annual production result in the troublesome surpluses.

# Livestock Prices Bring Farm Relief

By S. W. Russell,
Commercial Research Department, Swift & Company

AGRICULTURE has been suffering from low purchasing power from 1921 to date—when measured in terms of its purchasing power during the period just before the World War. A given quantity of farm products has not been exchangeable for as large a quantity of products ordinarily purchased by farmers, as it was before the war. This situation has had much consideration and various remedies have been proposed.

It is the purpose of this paper to review the changes which have occurred in livestock prices, as compared with the prices of other products. Of course, profits in an industry are not completely measured by changes in the purchasing power of the products of that industry, but such changes do have a very direct bearing on prosperity and hence are to be the basis of the following observations.

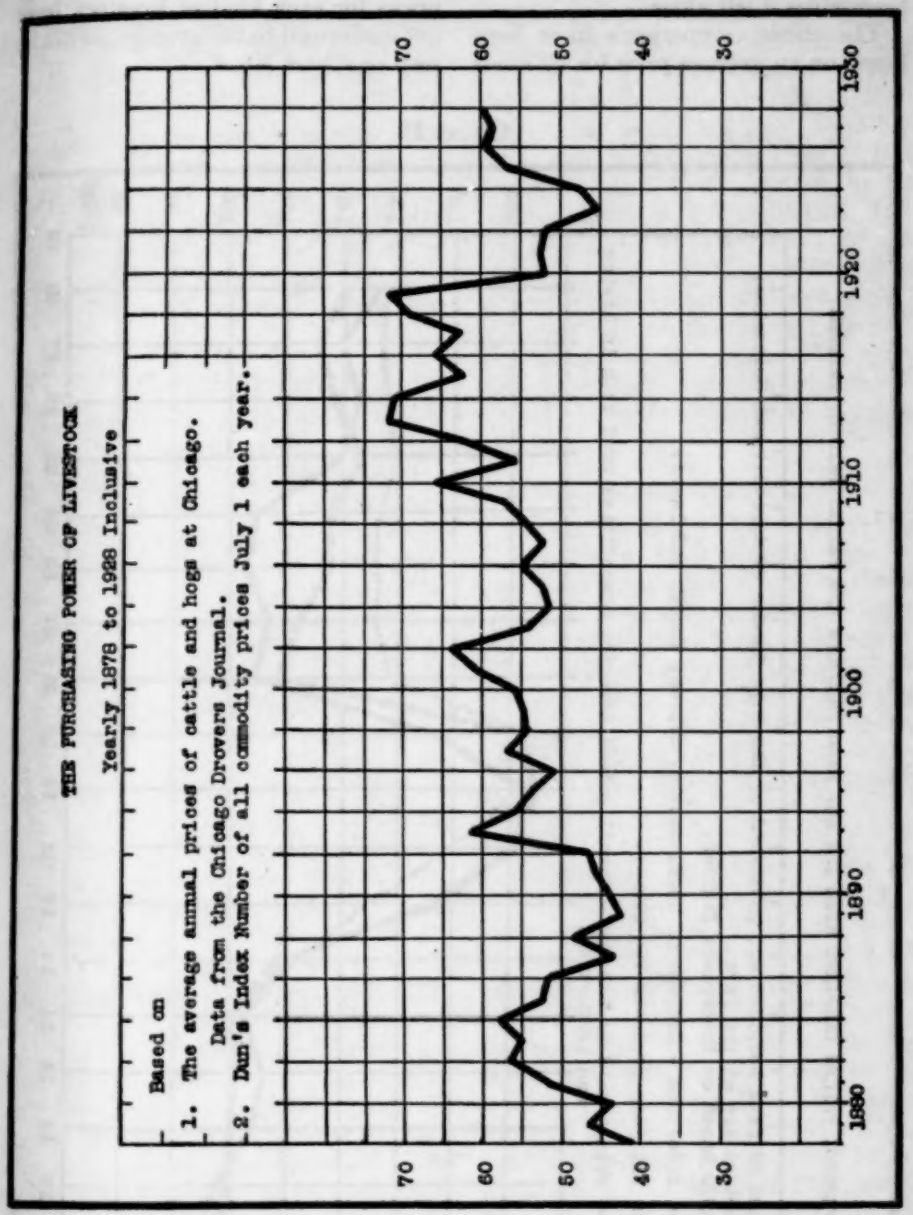
## Average Livestock Prices

The first evidence to be considered is shown on Chart No. 1. Here we have indexes of prices received by farmers for meat animals, compared with the average price of all farm products and the average price paid by farmers for the commodities which they buy. These indexes are compiled and published monthly by the United States Bureau of Agricultural Economics and probably represent the best approximation of the price changes which have occurred in these groups of products that has yet been made. We can see from these indexes that the prices of farm products, including livestock, declined much more severely in 1921 than did the prices paid by farmers. The average of all farm products increased steadily during 1922, 1923, 1924, and 1925; whereas the prices paid by farmers remained about steady, restoring a large proportion of the lost purchasing power to farm products, but not completely closing up the gap. Some of this gain was lost in 1926 and 1927, but was partly recovered in 1928, when it averaged about 90 per cent of pre-war.

Livestock prices remained at a comparatively low level during 1922, 1923, and 1924, but recovered sharply in 1925; and in 1926 went above the average of all farm products, where they remained during 1927 and 1928. In other words, as can be seen on Chart No. 1, producers of livestock as a group have fared better during the past three years than have producers of other kinds of farm products, on the average.

Livestock prices have not only exceeded the price of farm products, but have now practically reached the level of the prices paid by farmers for the things they buy. Incomplete data for 1928 indicates that the rise which occurred in livestock prices during that year brought the average price of hogs, cattle, calves, sheep, and lambs nearly up to the level of prices paid by farmers for the things that they buy. In other words, as far as the average price of livestock goes, there is now little—if any—more need for relief than there was on the average for the five-year period just before the war. When it is realized that this five-year period before the war was one in which livestock prices compared more favorably with non-agricultural prices than during any previous five-year period

CHART I

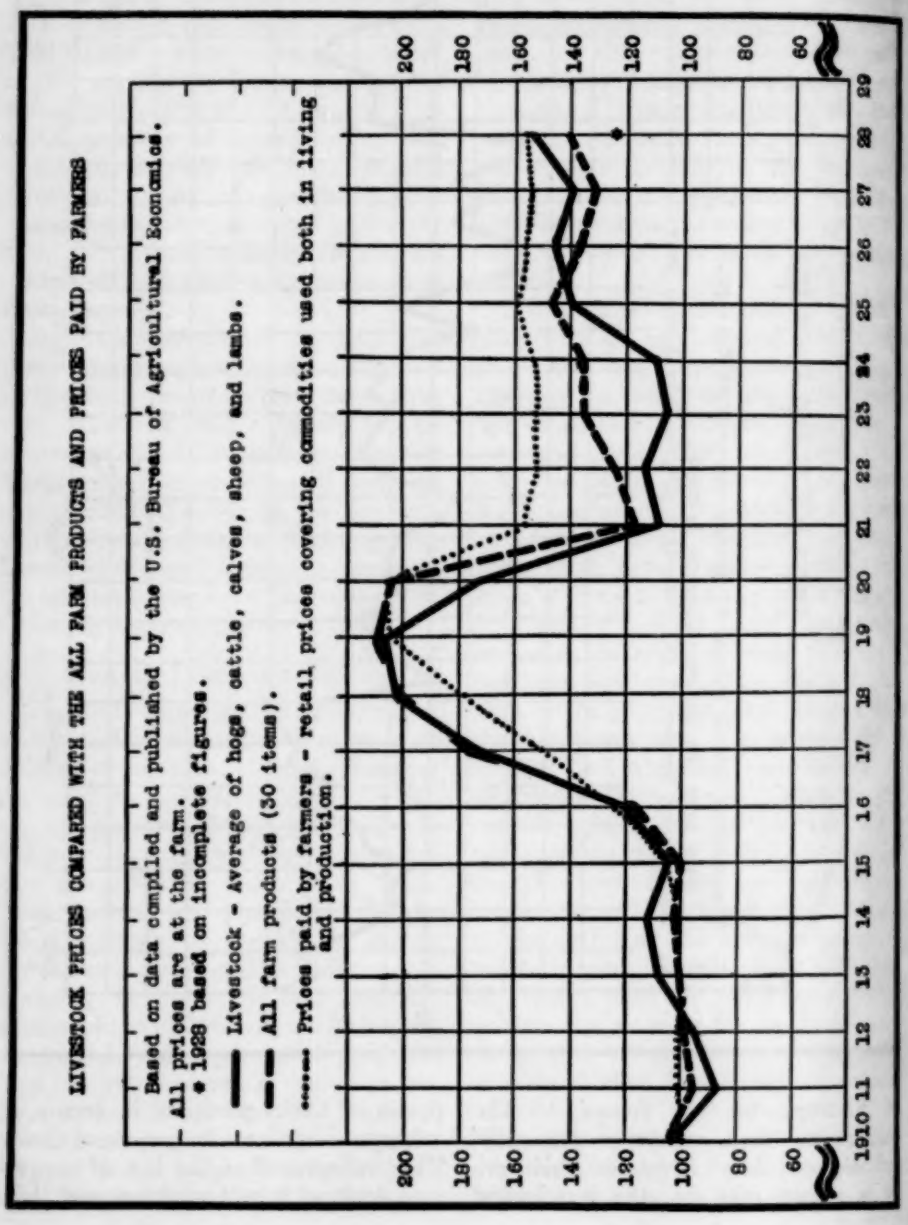



in history, we are forced to the conclusion that, whatever the difficulties and ills of livestock producers as a group may be, the purchasing power of their products in terms of other products is no longer one of them. This indicates that the law of supply and demand is still working, and that

price maladjustments will take care of themselves if left alone.

The above comparisons have been based on an average price for all kinds of meat animals. Needless to say, prices for each kind of livestock have not conformed to the average, as can be seen on Chart No. 2.

CHART II


LIVESTOCK PRICES COMPARED WITH THE ALL FARM PRODUCTS AND PRICES PAID BY FARMERS
Based on data compiled and published by the U.S. Bureau of Agricultural Economics.
All prices are at the farm.
* 1928 based on incomplete figures.
Livestock - Average of hogs, cattle, calves, sheep, and lambs.
All farm products (30 items).
Prices paid by farmers - retail prices covering commodities used both in living and production.
200
180
160
140
120
100
80
60
1910 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29

### LAMB PRICES

Lamb prices have been well above the level of prices paid by farmers, continuously, from 1922 to date and with an ever increasing spread. In fact, lamb prices have been above the level of prices paid by farmers every year, from 1912 to date, excepting only the years 1921 and 1922. Apparently the purchasing power of lambs is well established on a level distinctly above the level attained before the war.

### CATTLE PRICES

The decline in cattle prices which followed the war was accentuated and prolonged by the fact that cattle production had reached a period of overproduction in one of the long cycle swings which characterize that industry. Some such decline would probably have occurred even without the influence of the war inflation and postwar deflation. The war undoubtedly contributed to the severity of the decline, but it is well to recognize that cattle herds would probably have been somewhat excessive without the war and would have required a period of liquidation in any case. As it was, liquidation occurred from 1922 to 1926 inclusive. The consumption of beef per capita was forced upward from 57 pounds in 1921 to 63 pounds in 1926, according to the estimates published by the United States Department of Agriculture. Prices rallied gradually from the low levels of 1921–22, in spite of these increased supplies. And finally, in 1927, when liquidation had run its course, supplies decreased to 58 pounds per capita; and in 1928 they were further decreased to about 54 pounds. Prices rose noticeably in 1927 and vigorously in 1928, entirely closing up the gap and restoring the purchasing power of cattle prices to its high pre-war level.

### HOG PRICES

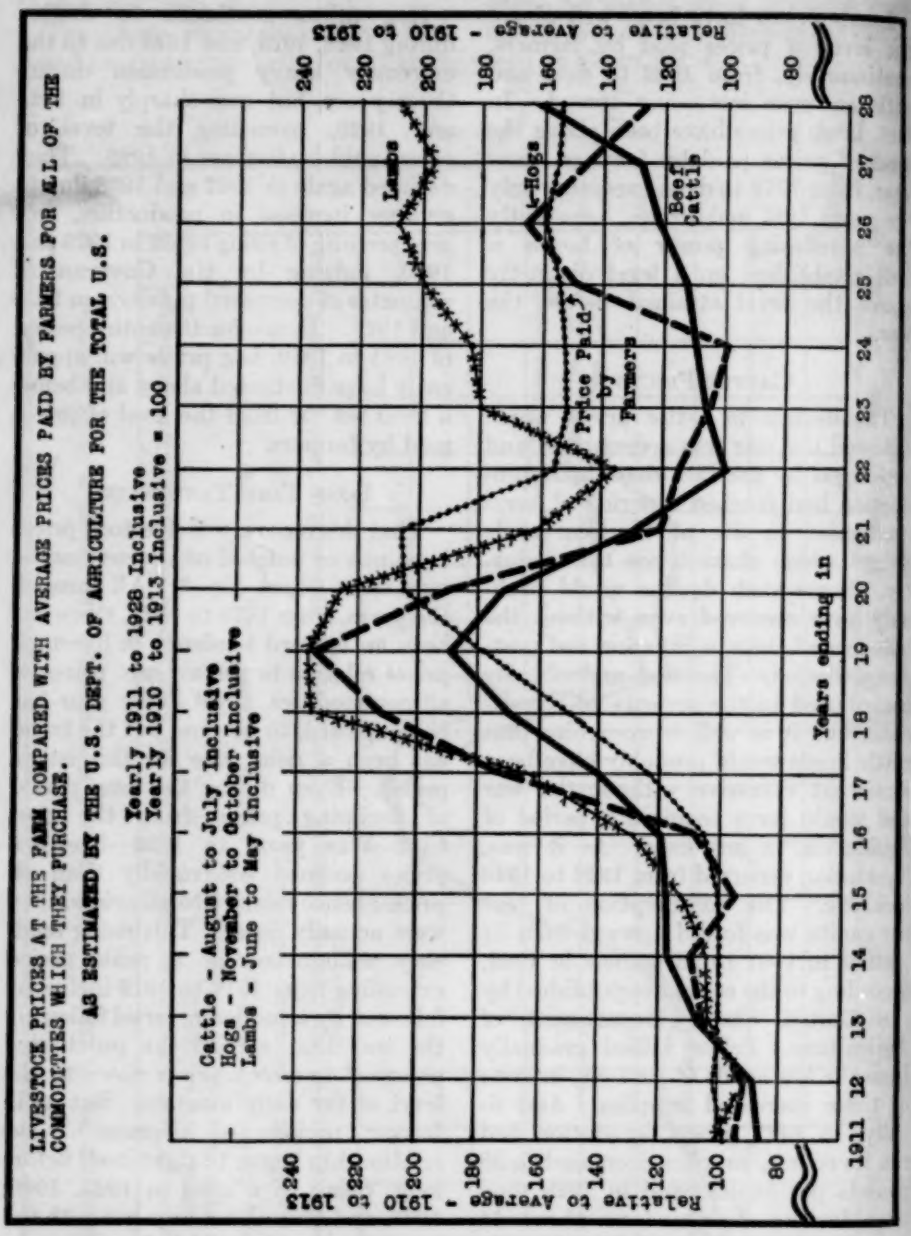
Hog prices continued to decline during 1922, 1923, and 1924 due to the extremely heavy production during those years, but rose sharply in 1925 and 1926, exceeding the level of prices paid by farmers in 1926. They declined again in 1927 and 1928 due to another increase in production, but give promise of rising again in 1929 and 1930, judging by the Government estimates of decreased pig crops in 1928 and 1929. Hence for the entire period of 1925 to 1930, hog prices will apparently have fluctuated above and below a level not far from the level of prices paid by farmers.

### LONG TIME TENDENCIES

That this recovery of livestock prices is no new or unusual occurrence can be seen from Chart No. 3. All through the years, from 1878 to 1928, there has been an upward tendency in livestock prices relative to the average prices of all commodities. Not every year has been upward, to be sure, but the trend has been a rising one for this entire period. Even during the long period of declining prices—from the post Civil War years to 1896—livestock prices declined less rapidly than all prices; hence relative to all prices, they were actually rising. This rising tendency culminated in a peak period extending from 1912 to 1919 inclusive, followed by a sudden reversal following the war that carried the purchasing power of livestock prices down to the level of the early nineties. But as in former periods of depression, the relationship began to right itself before long, rising to a level in 1925, 1926, 1927, and 1928 about on a par with the prosperous period just before the war.

The method of measuring the purchasing power of livestock used in Chart No. 3 is admittedly a very crude one and subject to many inaccuracies.

CHART III


LIVESTOCK PRICES AT THE FARM COMPARED WITH AVERAGE PRICES PAID BY FARMERS FOR ALL OF THE COMMODITIES WHICH THEY PURCHASE.
AS ESTIMATED BY THE U.S. DEPT. OF AGRICULTURE FOR THE TOTAL U.S.
Yearly 1911 to 1928 Inclusive
Yearly 1910 to 1913 Inclusive = 100
Cattle - August to July Inclusive
Hogs - November to October Inclusive
Lambs - June to May Inclusive
Relative to Average - 1910 to 1913
Lambs
Hogs
Beef Cattle
Price Paid by Farmers
Years ending in
1911 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28
240 220 200 180 160 140 120 100 80

However, the broad underlying tendencies are probably portrayed with sufficient accuracy for the purpose of this article. A comparison of this index with the very carefully constructed one by the United States Department of Agriculture from 1910 to 1928, indicates that the cruder index

probably serves to measure the major changes in the earlier years quite well.

This long record of performance by livestock prices certainly suggests that over any considerable period of time they can be depended on to exchange for an ever increasing amount of the commodities which farmers buy.

This buoyant tendency of livestock prices, combined with the many other advantages of raising livestock, suggest that the farmers who have consistently stuck to livestock production through good and bad times have not been in need of emergency farm relief legislation.

# The Industrialization of Agriculture

By Frank App
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AGRICULTURE is emerging from a so-called "way of living" to a commercialized, specialized, industrialized industry. Influential technological changes have taken place with the inauguration and application of scientific methods to production, accompanied by the effective use of machinery. The consumer's increased purchasing power, together with the modern way of living, has associated with it a far more elaborate service for the selection of the daily supply of quality food. The family no longer buys a side of beef, a barrel of apples, or a tub of butter. The family unit of purchase is now a quantity sufficient for one or not to exceed a few days' requirements. Quality has become an outstanding factor of importance. More of the finer foods, fruits, vegetables, milk, and eggs and less of the staples are consumed.

## The Position of Agriculture

Agriculture at present bears some resemblance to the handicrafts of the industrial revolution. The transition met many difficulties and the new economic units found many obstacles to overcome. However, the shift to larger units and mass production of the manufacturing industry has afforded great economies, created resources, strength and advantages as well as a higher standard of living, that an industry, dominated by the small family unit, could not acquire.

I believe it is generally conceded that since 1920 the problems of rapidly advancing technological progress in the field of manufacturing and transportation have been more successfully met than in the field of agriculture. Thus, for the successful economic organization of agriculture, it would appear necessary that the same advantages that have accrued to industry through mass production, should be made available to agriculture. Such advantages enhance the technological possibilities available through capital, equipment, management and other organizational features, which would provide greater control of agricultural production and distribution. The trend of our agriculture since 1920 presents a striking picture. The farm population from 1920 to 1924 has decreased about 10 per cent, but agricultural production increased about 5 per cent.

It is estimated that the efficiency per worker in agriculture has increased approximately 3 per cent per year since 1920. This increase may be attributed to both biological and mechanical changes in production. The grain crops have shifted farther west and north on lands better adapted to large scale machinery. The cotton acreage increased in Oklahoma and Texas, under large scale operation. Much rough, unproductive land in the East and South has been abandoned. From 1920 to 1924 the crop land decreased 13,000,000 acres.

At the same time the specialized crop or live stock farms are rapidly expanding and increasing, stimulated by the discriminating market and modern large scale, cost reducing machinery. A geographic selection and specialization of crops adapted to mechanized farming is taking place. This selection is increasing the acreage of the more productive crops at the expense of the less productive.

## INDUSTRIAL PRINCIPLES APPLIED TO AGRICULTURE

I believe most students of economics well remember the axiomatic statement that science, invention and the division of labor could do little to reduce human toil on the farm. Fear was expressed that the nation would soon be unable to produce sufficient food for its increasing population.

But now over production in agriculture is the dominant economic problem. The mechanization of agriculture, associated with better biological practices has increased the productiveness of land, livestock and labor. Science and invention are making marked progress in agriculture and the rapid increase of specialized farms has demonstrated the advantages of the division of labor, when applied to agriculture. The vanguard of this movement is exemplified by the successful development and operation of large agricultural units that are recognized as a successful illustration of industrial agriculture. Some of these units are applying the principles of mass production with gratifying results.

Industry has made phenomenal progress by decreasing the cost and raising the quality of its product. Agriculture can and is doing the same.

## POWER, KNOWLEDGE, AND MANAGEMENT, THE THREE ESSENTIALS FOR INDUSTRIAL AGRICULTURE

In 1916 there were 29,742 tractors on farms; in 1924, eight years later, 450,000, while in 1927 the number sold was 200,504. Since 1919 horses and mules decreased from 26,500,000 to 20,000,000 or 650,000 per year. The unit of power is rapidly shifting from horse to motor. In 1924 but 61 per cent of farm power exclusive of automobiles was horse and mule.

Recent developments in farm machinery are far too many to describe here. Modifications and additions have been made to tillage, harvesting and planting machinery. Soil pulverizers, rotary hoes, and disc plows are recent additions to our tillage machinery. The maintenance of a soil mulch to conserve moisture is being abandoned for weed control. Newer types of harvesting machinery are replacing human labor. The number of combines manufactured and sold for harvesting and threshing of grain in 1920 was 2,717, and in 1928 about 21,000. Multiple unit planters and cultivators are being substituted for the smaller machines. High labor costs have greatly augmented this transition from human to machine power for the purpose of reducing production costs and obtaining a higher quality product.

Large scale, low cost, quality production methods are making tremendous changes to the industry where introduced. The use of tractor power in cotton raising with tractor plow and four row machines for planting and cultivating enable one man to prepare the seed bed, plant and cultivate 200 acres or more of cotton. At the same time a large scale method of harvesting, known as sledding has been developed, which allows one man to harvest 4 to 5 acres of cotton per day. Along with this the mechanical cotton picker is being introduced with encouraging results. It passes along the rows, removes the ripe cotton from the ball, and leaves undisturbed the unripe balls, flowers and leaves. Where one man with his mule and family formerly produced 20 acres of cotton, a man with tractor and machinery now produces 200 acres.

The hard winter wheat belt had 2,493 tractors in 1915. By 1926 this same region had 33,852. The earlier tractors were built to pull two to three bottom plows. They are now buying

tractors large enough to pull three to five or more.

About 1917 the combine was introduced in this region. In 1927 it was estimated that more than half the wheat was so harvested. Those first introduced cut a swath 9 feet in width. These were widened to 12, then to 16 feet, and now some machines 48 feet wide are in use. Some of the advantages of large scale grain production were summed up by W. E. Grimes of the Kansas Agricultural College in a paper read before the American Farm Economic Society as follows: (1) Reduction in hazard of production of wheat; (2) an increased opportunity to secure high yields of better quality grain; (3) better farming; (4) reduced bushel costs; (5) replacement of labor with capital; (6) shorter period between harvest and marketing of wheat.

Whole train loads of combines were shipped to one distributing point of Topeka, Kansas, in 1927. They have not only invaded the hard winter wheat belt, but extend from coast to coast, California to Delaware.

The technical control and mechanization of the forage crop industry promises equal advantages through the introduction of dehydration. The application of artificial heat replaces the vagaries of sun curing so precarious in the East and South. The quality products obtained from artificial dehydration place it in an entirely different class from the sun-cured hay. The same grass dried artificially will have a higher protein content and an apparent greater digestibility than if sun-cured.

Thus the forage crop industry has its dehydrator, the grain industry its combine, the corn crop its multiple planter, cultivator and harvester, the cotton industry its sled and mechanical picker, all associated with motor power. Truly this is a trend to mass production and industrial agriculture.

### MECHANIZED AND MOTORIZED AGRICULTURE MULTIPLIES MAN POWER

Wheat as ordinarily produced in the middle Atlantic states requires 15 to 20 hours of man labor per acre, and until recently about eight hours for the wheat belt states. Today well organized, large scale farms of the wheat belt are producing wheat with two hours of man labor.

The corn crop as grown in the Eastern States with two horse machinery in common use requires about 60 hours of man labor per acre. Recently Iowa State College with large scale machinery produced corn with 3.83 hours labor per acre. One man grows 200 acres of cotton in Texas with tractor and large scale machinery. In the older cotton belt of the South, one man with his mule and family grows 20 acres. It is estimated that one hour of human labor harvests between 4 and 5 pounds of cotton in the older cotton belt, while an hour of human labor will harvest 70 pounds of cotton when using large scale methods such as those followed in Texas and Oklahoma.

The application of power and machinery is likewise taking place in the livestock industry. A unit of poultry production without power and mechanized equipment is about 1,500 birds per man. The specialized areas of California and New Jersey report specially constructed plants, operating as high as 10,000 birds per man. The dairy has its mechanized milker. Plans are now under way to transfer the milk from the cow to the bottles in one operation mechanically and in such a manner that at no time will it be exposed to human contact.

### KNOWLEDGE MAKES POWER EFFECTIVE

Knowledge, obtained from research, investigation and farm experience, which allows technical control of plant

and animal production, is now at the disposal of agriculture. Diseases and insects infest our crops, and livestock. Their life history under new environment must be studied. Materials or methods for combating had to be found, and then an effective means for application. The successful checking and in some instances complete eradication of the Texas cattle tick, boll weevil of cotton, the Hessean fly of wheat, abortion of cattle, blackhead of turkeys, cholera of hogs, are a few of the many illustrations that might be named of protected production.

Through breeding the purebred and grade animal has replaced the scrub. Ton litter hogs have become plentiful, dairy herds producing 10,000 pounds of milk per cow are a fact and the 200-egg hen has come to stay. The plant breeder has produced higher yielding strains of grain, vegetables, fruits and grasses. Certified seeds that guarantee quality and breeding are dominating the seed industry.

The effect of this technical control to agriculture is well illustrated in the apple industry. The farm orchard is disappearing. For every 100 apple trees in 1910 there remained but 64 in 1925. But the supply of commercial apples has increased. The technical control applied to apple production has increased total production, although less than two thirds of our trees remain. The poultry industry is another example of the value of technical control. The State of Iowa has more chickens in her farms than any other state. It is a representative farm flock state. The production per hen is 53 eggs. The highly commercialized and specialized poultry areas of California and New Jersey have large flocks producing as high as 200 eggs per hen; flocks producing under 140 eggs per hen are considered unprofitable.

### MANAGEMENT

The effective combination of power and knowledge is the science of management. Farm managers equipped with the science and art of agriculture are becoming prominent in the commercial agricultural industry. They are blazing the way for industrial agriculture.

Labor-saving machinery, biological knowledge of agriculture and quality as a factor for merchandizing are the foundations upon which sound management must rest. The past ten years have witnessed a more marked trend to labor-saving machinery than any preceding period. High labor costs have provided the incentive for this change.

Our agricultural institutions through research have accumulated a vast fund of knowledge, much of which is not generally applied to agriculture. The higher standard of living has increased the demand for quality products from both industry and agriculture. The successful application of these factors requires astute and experienced management. The number of experienced managers is quite limited. Our agricultural institutions have usually frowned on industrial agriculture. Their observations were unfavorable. The family unit was accepted as the only economic operation. Consequently management as investigated and usually taught by our agricultural institutions does not apply to industrial agriculture. The interest manifested during the past few years was due to the success and expansion of large scale operations.

### KNOWLEDGE AND POWER, THE FOUNDATION OF LARGE SCALE FARMING

The past has seen many corporate and large scale farm failures. But not all were failures. Some have successfully operated throughout the depression and maintained their annual

dividends to their stockholders. One success outweighs many failures. That it is a possible commercial enterprise has been proven. However, the large number of failures has left the foundation for success obscure in the minds of many. It is well that large scale farming should meet opposition. Its development should proceed with care, so as to avoid the mistakes so frequent in the past. Agriculture is acquiring many of the features of industry. The effect will probably be much the same.

Large scale and corporation farms will increase. Their success will not destroy rural welfare, but instead it will advance farm prosperity. A system of farming that will produce the greatest amount of quality product per worker will attract capital management and allow a better reward to labor. The family farm will not disappear. Its welfare will be enhanced through the better markets made possible by the large scale farms.

### THE TYPE OF ORGANIZATION FOR LARGE SCALE FARMING

The organization for large scale operations must be such that it will allow the proper technical control for efficient production, permit the use of modern machinery and foster the initiative of human labor.

This requires centralized buying and marketing, centralized management, but not necessarily centralized production. A long established and successful large corporate dairy on the Atlantic Coast has centralized buying, marketing, management, but not production. The raising of crops and of heifers for the herd is decentralized. These are produced under contract, but with the technical control made possible by centralized management. Large scale egg hatcheries of quality chicks have centralized all operations except the production of eggs for the hatchery. These are produced under contract, but with the supervision and technical control of the central management.

Centralized large scale management with decentralized as well as centralized operation is developing in the corn and wheat belts. The results reported have been very gratifying for both the owner and tenant, or laborer. It is probable that both forms of operation will develop. If our accumulated knowledge of agriculture, combined with the development of important labor-saving machinery, furnishes a foundation for industrial agriculture, its merits should be recognized and its weaknesses corrected. The need for greater effectiveness of labor made possible by motor power, machinery and knowledge is its foundation for development.

If it can add to agriculture the same advantages as have accrued to industry, its expansion should be hastened. The industrialization of manufacturing has enhanced the opportunity of the individual and raised the standard of living heretofore unattainable. Its successful application to agriculture will do the same.

### THE INFLUENCE OF INDUSTRIAL AGRICULTURE TO THE RURAL POPULATION

A great deal of opposition prevails against industrial agriculture because of the common belief that it will destroy the sound social structure of the rural community and in that manner have a demoralizing effect on this part of the population whom we have always considered to be of the most stable nature. As yet a careful analysis of this development will not bear out such a contention. If industrial agriculture succeeds, it must be because of its greater economy of operation, which in turn will give the individual engaged in agriculture an increased reward, as well as a higher standard of living.

Individual illustrations might be cited at the present time, which point very strongly to the higher standard individuals have obtained where industrial agriculture is operating successfully for a long period of time. Instead of destroying the social structure of the rural community, it has materially raised the morale and standard of living, as well as the community spirit, by its presence. Unquestionably, unwise operations must prove it unsatisfactory. However, the sound development and economic transition of the agricultural industry will not fail to recognize the value and importance of the individual. The net result must be one for conserving and raising the standard of life for our rural communities.

## THE APPLICATION OF ELECTRICITY TO AGRICULTURE

Electricity applied to agriculture has a tremendous social as well as economic influence. The standard of living for a modern home, whether rural or urban, demands the extensive use of electricity to eliminate drudgery of the household and provide comforts otherwise unattainable.

In order that our rural population may maintain its high standard and character, it is necessary that the comforts obtainable under urban conditions shall also be obtainable under rural conditions; without the help of electricity on the farm, this is almost impossible. The desire for convenience and comfort on the part of the rural population is growing at a very rapid rate and, unless it can be satisfied in a practical manner, it will have a tendency of hastening the migration of our best rural citizens to the urban centers.

On the other hand, the economic value of electricity as applied to agriculture is rapidly becoming recognized. The time is at hand when those responsible for distribution of electricity should recognize the place it has in agriculture and take the necessary steps for its provision. The conditions that must make this application properly effective are the greater appreciation on the part of agriculture to its application in the operations of the farm, as well as the comforts in the home, and a rate schedule which makes it permissible for the farmer to use electric power.

Unfortunately, many of our public utility companies have a rate schedule which is not at all adapted for rural or agricultural use. The schedules that have been developed to serve the urban home and urban industry are not satisfactory for rural use. For example, a very common rate schedule of the utility companies is one which provides for three classes of rates: power, commercial and domestic. The power rate is usually low and must compete with power which may be provided from sources other than electricity. The commercial rate is somewhat higher, as the consumer doesn't use so much, whereas the domestic rate is still higher. Frequently, electricity runs 10 cents or more per killowatt per hour. Agricultural engineers maintain that this rate schedule is not based upon the cost of production, but rather upon custom and what the traffic will bear.

Be that as it may, it is obvious that the farmer doesn't wish to have three meters installed for the purpose of supplying him with light and power. A rate schedule such as the one which classifies the use in these three classes would in most cases require the fully equipped farmer to have three meters and pay for electricity at these different rates, depending upon the purpose for which it was to be used.

Such a system makes it unwieldy, uneconomical and limits the use of elec-

tricity for agriculture. A Committee on the Relation of Electricity to Agriculture, which recently made an examination of the uses to which electricity may be put on the farms, found that approximately 200 different uses were already in effect. A farm represents both a home and a business. A rate schedule applicable to both is necessary.

When we consider that there are 6,000,000 farms, of which a large portion could or should be supplied with this kind of service, we can realize the potential place that electricity would have in cheapening the cost of production on the farms, as well as its tremendous influence in the home.

The National Committee on the Relation of Electricity to Agriculture found in the 27 states of which they made a survey, the use of electricity had increased 86 per cent in the three years' time since the census of 1924. They estimated that in 1927 there were approximately 300,000 farmers being served with electricity from a central plant, and an equal number that were served by the farmer's individual plant. This development has taken place in spite of the fact that many of our power companies have not yet understood the needs of agriculture and have not made provision to meet them on a practical basis. The time for the application of electricity to agriculture has arrived. The difficulties of rate schedules, equipment and information of its uses will be overcome. The standard of living demanded for the rural home and the greater use of machinery are accelerating rural electrification.

# Agricultural Contrasts

By L. W. Wallace
Executive Secretary, American Engineering Council

THERE are two significant sets of data relating to agriculture. One shows a wide margin of performance in each of a large number of agricultural operations. The other shows that by the use of improved farm equipment and mechanical and electric power, highly satisfactory results are being accomplished. These data present a puzzling situation and set the inquiring mind to work.

It is the purpose of this paper to present illustrations from each set of data, and to draw from them some general conclusions.

## Agricultural Costs

The cost of producing butterfat on 25 farms in the same community in Minnesota, varied from 29 to 71 cents per pound, and the returns from the cows ranged from a loss of $36 to a profit of $67 per cow per year.

The milk production contest of the Iowa Contest Association showed the following results: The food cost for a group of cows producing 500 pounds of butterfat per year was 17 cents a pound, whereas the food cost for a 200 pound group was 22 cents per pound. The labor return on the 500 pound group was 39 cents per hour, and on the 200 pound group 6 cents per hour. The men who owned the cows which produced from 100 to 125 pounds, contributed 12 cents per hour for the privilege of owning, feeding and caring for the cows.

In Nebraska, the number of pounds of pork gained per bushel of corn fed, ranged from 7 to 12. The cost of the feed ranged from 5½ cents to over 14 cents per pound of pork gained.

From 1922 to 1924, inclusive, in Humboldt County, Iowa, the amount of corn fed for 100 pounds of pork produced, varied from less than 5 to more than 13 bushels.

In 1926, reports from statistical poultry farms in Minnesota showed that the cost of feed varied from $1.00 to $2.55 per hen per year. The returns from hens ranged from a loss of 30 cents to a net profit of $1.50 per hen per year. Chicken flocks varied from 30 to more than 125 eggs per hen per year.

In 1927, in Western Nebraska, it cost 32 cents to produce a bushel of wheat whereas in eastern Nebraska it cost 86 cents. In the 10 acre corn yield contest in Nebraska in 1924, one farmer produced 76 bushels per acre with an expenditure of 11.2 man hours per acre. Another farmer produced 76 bushels per acre with an expenditure of 3.3 man hours per acre. The first made a profit of $12.63 per acre, and the latter a profit of $18.63 per acre.

The cost of producing corn on one farm in Iowa, in 1923, was 15 cents per bushel, whereas the cost on an adjoining farm was 75 cents per bushel. The farm which produced corn at 75 cents per bushel was as good as the one which produced it at 15 cents per bushel.

The 1925 records of the "More Cotton on Fewer Acres" contest, of the Dallas (Texas) *News*, shows some striking facts. The plots were 5 acres. The average production of lint cotton per acre for the state was 133 pounds, and the average cost was 21.4 cents per pound. However, in the contest, 27 farms produced an average per acre of 1,241 pounds at a cost of 4.7 cents per pound. The performance of a group

of 18 farms was 875.6 pounds per acre at 5.9 cents per pound. Thirty-two farms averaged 730.6 pounds per acre at a cost of 6.8 cents per pound.

Each work horse on a group of Iowa farms is used from 500 to 1,330 hours per year. The average use is 910 hours. Seven farms cultivated less than 15 acres per work horse per year whereas the average for the group was 22 acres.

Such records as the foregoing raise many questions. The thoughtful man wants to know the "why" of such variations. He asks: Why is one farmer able to accomplish so much more than his neighbor? What are the factors contributing to such differences? Were all the farmers to show the results the best ones do, would there be a farm problem to vex the nation? Have some farmers found the way out, and if so, what is it?

A sufficient body of data has not been collected and analyzed to justify a conclusive answer to such questions. The most that can be said is that they present a puzzling situation.

The second set of data, when carefully analyzed, is illuminating and suggests an answer to the questions to which the first set gives rise.

## USES OF MECHANICAL EQUIPMENT

Dairymen have been making marked advances in many directions. They are giving far more intelligent attention to the selection and food of the dairy cow and to the equipment and the management of the dairies. There are to be found dairies equipped with such mechanical, power-driven aids as milking machines, cream separators, utensil washers and sterilizers. This equipment greatly reduces the labor costs and produces a better quality of product.

An investigation made in Indiana showed that the time required to hand-milk each cow per day ranged from 13.5 to 17.6 man-minutes, and the milker did not take care of the equipment used. The time required to milk each cow per day with a milking machine, including the care of the machine, ranged from 8 to 9 man-minutes. Other mechanical dairy equipment shows a corresponding increase in efficiency.

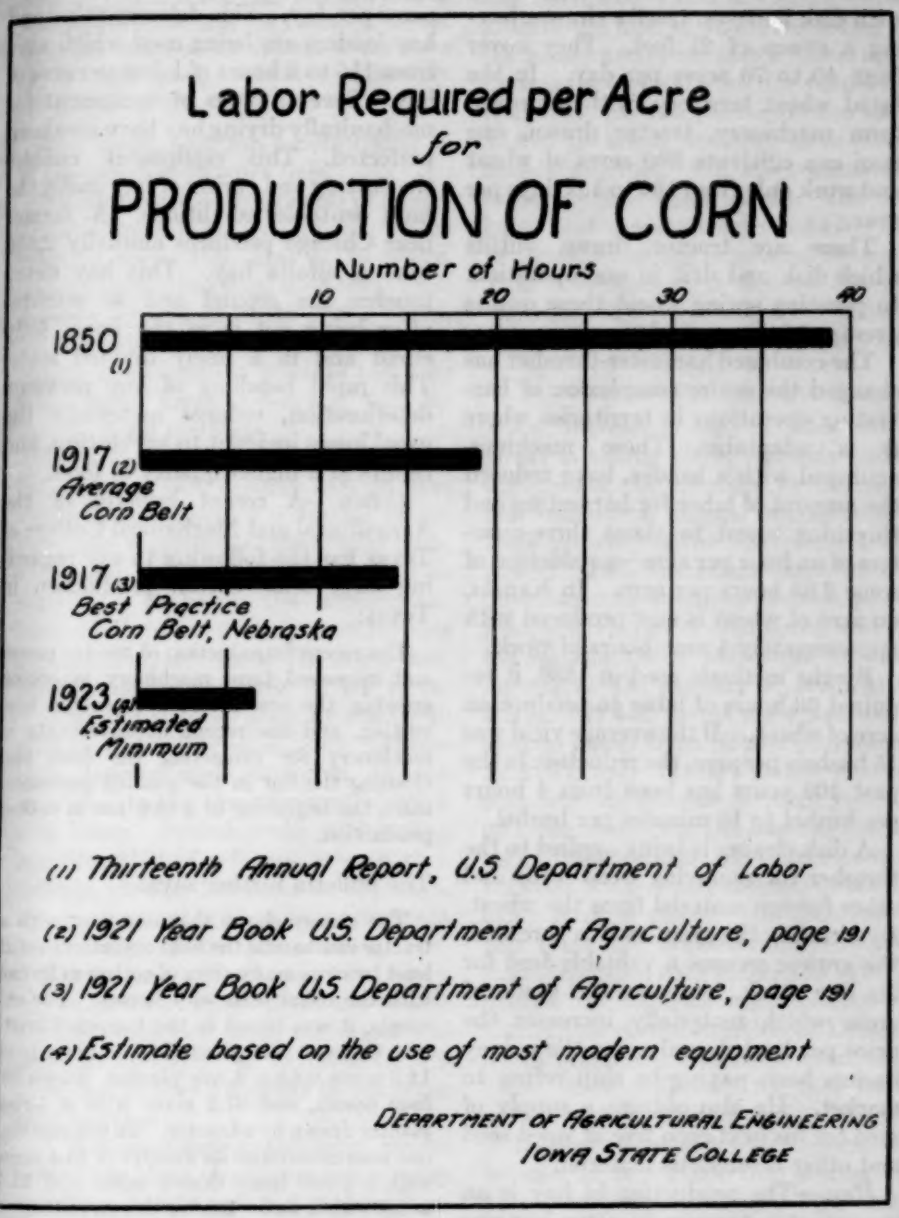
*Corn.*—Great strides are being made in the production of corn. There are now being used 4-row corn planters which plant corn at the rate of 40 acres per day. There are in use rotary hoes for tilling corn, soy beans, beets, mint, and the like. These rotary hoes have 29 revolving wheels, each of which carries 16 points, which make 464 ground punctures per 6 feet of travel. Those that carry 7-foot sections, tractor drawn, cover 50 to 60 acres per day.

There are corn binders which will do as much work in four hours as can be done by hand in six hours. In some states the old method of producing corn required 60 man-hours per year per acre. With modern mechanical methods, it requires only 5 man-hours per year per acre. Such mechanical means have made possible the large reduction in the labor required per acre of corn as shown on Chart 1.

Mechanical methods are proving to be one of the most effective means of preventing the devastations of the corn borer. One type of binder used for this purpose is equipped with high speed reciprocating knives, which cut the corn at ground level so that the majority of borers in the stalks can be removed from the field. There is another type which carries blades making 500 revolutions per minute. This speed is sufficient to split the stubble into slices less than one-eighth of an inch, hence there is little chance for the borer to escape.

*Wheat.*—In an earlier paragraph, it

Chart I


Labor Required per Acre
for
PRODUCTION OF CORN
Number of Hours
10
20
30
40
1850 (1)
1917 (2) Average Corn Belt
1917 (3) Best Practice Corn Belt, Nebraska
1923 (4) Estimated Minimum
(1) Thirteenth Annual Report, U.S. Department of Labor
(2) 1921 Year Book U.S. Department of Agriculture, page 191
(3) 1921 Year Book U.S. Department of Agriculture, page 191
(4) Estimate based on the use of most modern equipment
DEPARTMENT OF AGRICULTURAL ENGINEERING
IOWA STATE COLLEGE

was shown that in Western Nebraska, it cost 82 cents to produce a bushel of wheat, whereas in Eastern Nebraska it cost 86 cents. This difference is largely due to large scale operation and the utilization of power and machinery. In many sections of the country the production and harvesting of wheat and other small grain has been revolutionized in recent years. For instance, the

ground is being prepared for planting, with disk harrows, tractor drawn, having a sweep of 21 feet. They cover from 40 to 70 acres per day. In the listed wheat territory, with improved farm machinery, tractor drawn, one man can cultivate 320 acres of wheat and work only from 100 to 152 days per year.

There are tractor drawn outfits which disk and drill in one operation. In planting spring wheat these outfits average 93 acres per day.

The combined harvester-thresher has changed the entire complexion of harvesting operations in territories where it is adaptable. These machines, equipped with a header, have reduced the amount of labor for harvesting and threshing wheat to about three-quarters of an hour per acre—a reduction of some 2.85 hours per acre. In Kansas, an acre of wheat is now produced with approximately 4 man-hours of work.

By the methods used in 1830, it required 60 hours of labor to produce an acre of wheat. If the average yield was 15 bushels per acre, the reduction in the past 100 years has been from 4 hours per bushel to 16 minutes per bushel.

A disk cleaner is being applied to the thresher for removing weed seeds and other foreign material from the wheat. By cleaning the grain as it is threshed, the grower secures a valuable feed for his live stock, increases the grade of grain which materially increases the price per bushel, and saves the money he has been paying to ship refuse to market. He also obtains a supply of seed for his next crop free of weed seed and other deleterious material.

*Hay.*—The production of hay is an important enterprise in some sections of the country. In this enterprise the same character of development is taking place as in the production of corn and wheat. There are to be found tractor drawn mowers which cut a width of 7 feet and cover from 50 to 70 acres per day. Side delivery rakes and hay loaders are being used which save from 1½ to 2 hours of labor per acre of hay. Several types of equipment for mechanically drying hay have also been perfected. This equipment enables the cutting and curing of hay under the most suitable conditions. A farmer near Chicago produces annually 2,500 tons of alfalfa hay. This hay never touches the ground and 45 minutes after being cut is in the barn, fully cured and in a finely divided state. This rapid handling of hay prevents deterioration, reduces materially the usual losses incident to harvesting, and results in a higher quality of food.

*Cotton.*—A recent bulletin of the Agricultural and Mechanical College of Texas has the following to say regarding large scale cotton production in Texas:

> The recent introduction of tractor power and improved farm machinery in cotton growing, the new methods in cotton harvesting, and the recent improvements in machinery for extracting the burs and cleaning the lint in the ginning processes, mark the beginning of a new era in cotton production.

The bulletin further says:

> The survey shows that one man with a tractor can handle the field operations on at least twice as many acres of cotton as he can with the usual team of 4 horses. For example, it was found in the Corpus Christi area that one man planted on an average of 14.3 acres with a 2-row planter, drawn by four horses, and 37.5 acres with a 4-row planter drawn by a tractor. In cultivating, one man covered on an average of 15.4 acres with a 2-row horse drawn outfit and 43.5 acres with a 4-row tractor drawn outfit.
>
> The extensive methods in growing cotton as above alluded to, have greatly intensified needs for quicker and more economic methods of harvesting. During the last two or three seasons, a so-called "sledding" has been largely used in harvesting cotton in

some sections of Texas. The usual crew for sledding cotton is one man and two horses. Twenty-six farmers in the Lubbock, Texas, area, harvested on an average of 4.4 acres per day from which 1.8 bales of cotton were obtained at a cost of $2.78 a bale.

The usual cost for hand-picking is in the order of $15 per bale.

Tractors with cotton duster or spraying attachments are being used. These tractors cover 100 acres in 10 hours. The aeroplane has been used for several seasons in some sections of the South for dusting cotton. These mechanical means have made it possible to cover much larger areas at less cost than by the old hand methods.

*Tillage.*—The foregoing discussion has pointed out certain uses of mechanical equipment for special crops. However, regardless of the type of crop, a general cultivation of the land is required. Probably the accomplishments in improved equipment for this purpose outrank those for any other. For instance, in South Africa it requires from 80 to 90 oxen, driven by 10 men, to plow 10 acres in a day. Three-plow tractor units operated by one man can do the same amount of work in 8 hours. Probably the outstanding record is that of a farmer who, with a tractor, plowed 110 acres in 5½ days. His best record with a six horse team was 30 days for the 110 acres.

Five men with 5 tractors, each equipped with 14-inch plows and traveling 13 miles per hour, can plow 640 acres in 12 days. It would require 5 men and 10 horses 64 days to cover the same acreage.

A 2-plow tractor not only covers more than three times as much per day as a two horse team but it does it at one-half the cost per acre.

The use of the tractor has so developed on the American farm that there are now several hundred farms operated without horses. The number of horses used on American farms has decreased 7,000,000 in 10 years. During the last 10 years, according to the most careful estimates based upon Census Bureau statistics, the number of tractors in use has increased from some 80,000 to about 767,000, or approximately ten fold. On Iowa farms the following has been shown: The net horse cost per crop acre is $4.61; the net tractor cost per crop acre, 69 cents. This development is due to the advantages offered by the tractor on farm units of sufficient size to justify its use.

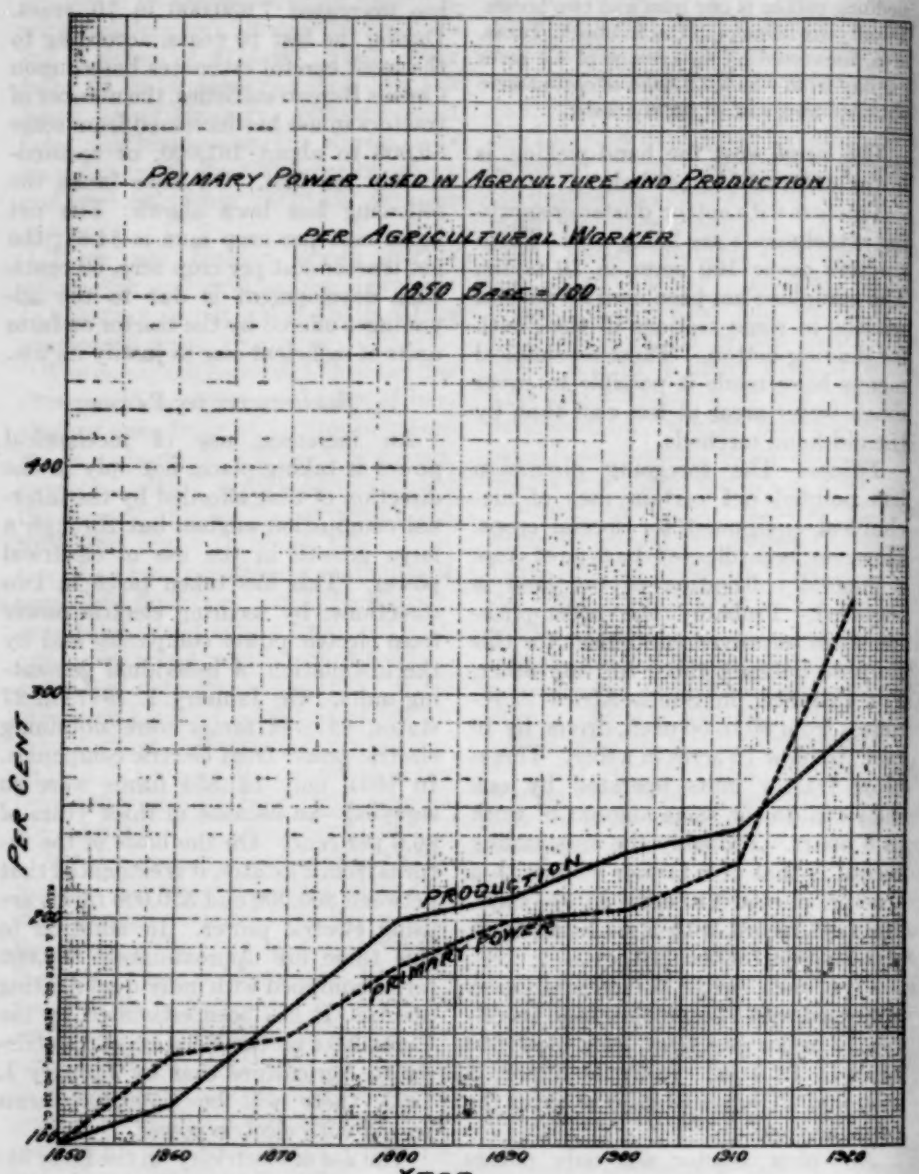
### ELECTRICITY ON FARMS

An increased use of mechanical power is taking place, not only in the direction of that afforded by the internal combustion engine, but through a large growth in the use of electrical power. This has taken place in two directions: by securing electric power from electric power companies and by the installation of individual generating units. On January 1, 1927, in 27 states, 227,442 farms were obtaining electric power from electric companies. In 1924, only 121,854 farms were so supplied—an increase in three years of 86.6 per cent. On the basis of the returns from 27 states, it is estimated that between 300,000 and 350,000 farms are using electric power. In addition to this there are approximately 300,000 farms equipped with individual lighting plants. It has been estimated by the Committee on the Relation of Electricity to Agriculture that by January 1, 1933, there will be 1,500,000 farms served with electric power.

The use of electricity on the farm has become so important that during the past two years about 60 light companies have organized rural electric service departments. In addition, there are 43 companies having at least one man giving full time to this service.

The Committee on the Relation of

Chart II




Electricity to Agriculture, during the last four years, has made an intensive and thoroughly reliable study of the possible uses of electricity on the farm. The Committee has determined that there are 227 possible uses and 190 additional possible uses in rural industries. In many parts of the United States, this committee, in coöperation with the agricultural colleges and farm-

ers, is making a thoroughly practical demonstration of many of these uses.

The marked increase in the use of mechanical and electric equipment in agriculture during recent years is of great importance. Probably more advances have been made in this regard in the last 25 years than in previous centuries. Some measure of this advance is indicated by the value of implements and machinery used per acre of land being farmed. In 1850 it was 52 cents; in 1910, $1.44; in 1920, $3.76.

### POWER AND PRODUCTION

Chart II, prepared by Mr. Arthur Huntington, Vice-President, of the American Society of Agricultural Engineers, shows the percentage of increased use of primary power in agriculture per agricultural worker, from 1850 to 1920. The chart also shows the relation between production and the amount of power used. It will be noted that as the amount of power per worker increased the production per worker increased at a greater rate, except during the period from 1850 to 1865 and the period from 1914 to 1920. During the first period there was competition between the ox and the horse, and hence some duplication of power. In the latter period there was competition between the horse and the tractor, during which time there was also duplication of power. It is reasonable to expect that with the increased use of the tractor the production line will in a relatively short time be higher than the power line.

Chart III, also prepared by Mr. Huntington, shows a striking relationship between power and production. For instance, in Alabama one horse power per agricultural worker netted $500 in crop value per worker, whereas in South Dakota fifteen horse power per worker returned a crop value of $1750 per worker.

The relation between investment in farm machinery and the value of all crops per person engaged in agriculture is shown in Chart IV. Note that as the investment in machinery increased the value of the crop per person engaged in agriculture increased, but at a much more rapid rate.

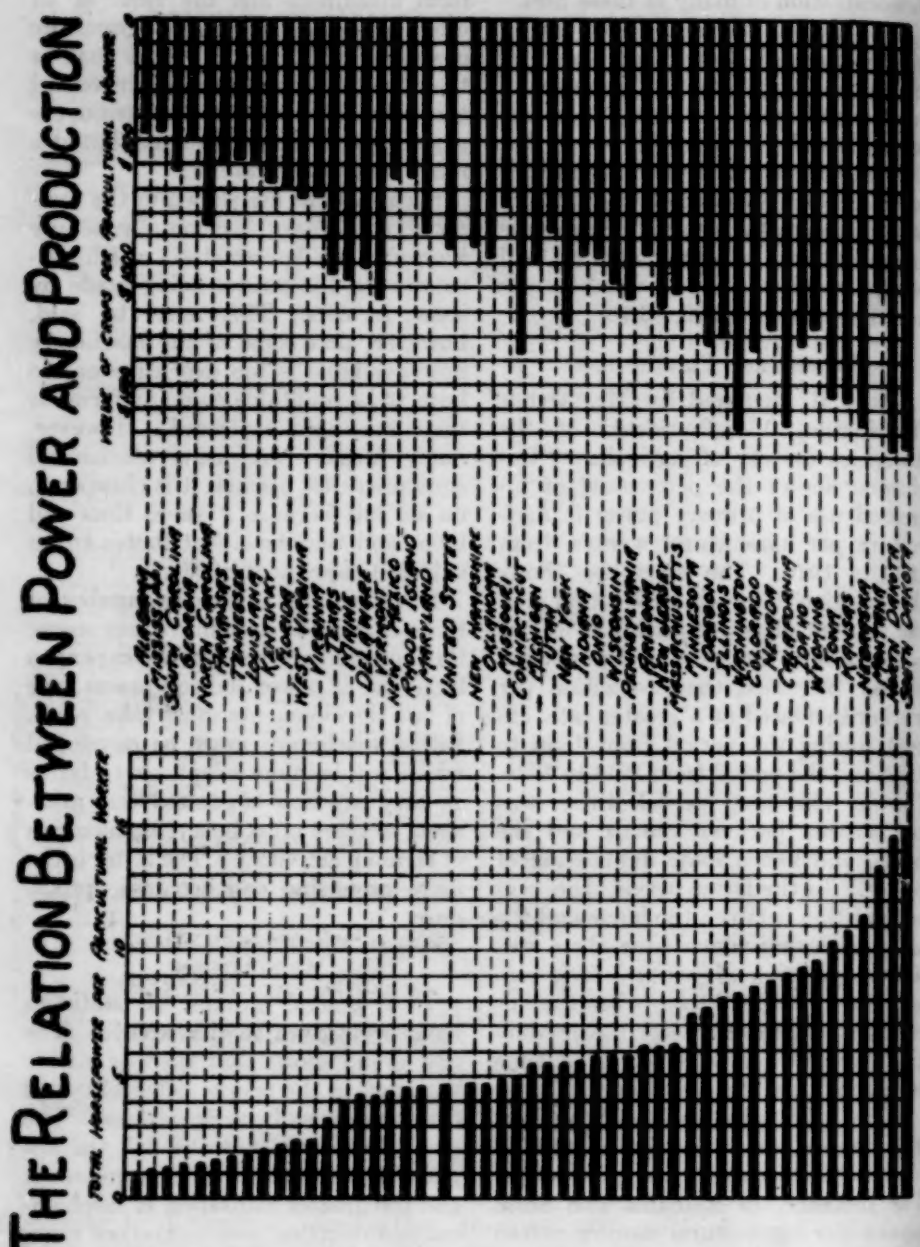
Such facts as are shown in the foregoing charts are becoming generally known and appreciated which accounts for the strides being made by some farmers. This must be said, however, that some of the machinery now available is too expensive or too large to be profitable on many farms as they are now organized. However, many farmers are using mechanical equipment not because it is cheaper to do so, but because it saves time and labor and therefore contributes to an enlarged enjoyment of life.

In order that a greater number of those engaged in agriculture may secure the increased profits that accompany a larger use of power and equipment, one of two developments must take place. Either machinery must be developed which will be more adaptable to farms as they are now organized and managed, or there must be a reorganization of farming activities. The latter is the more promising and economic procedure.

### CONCLUSION

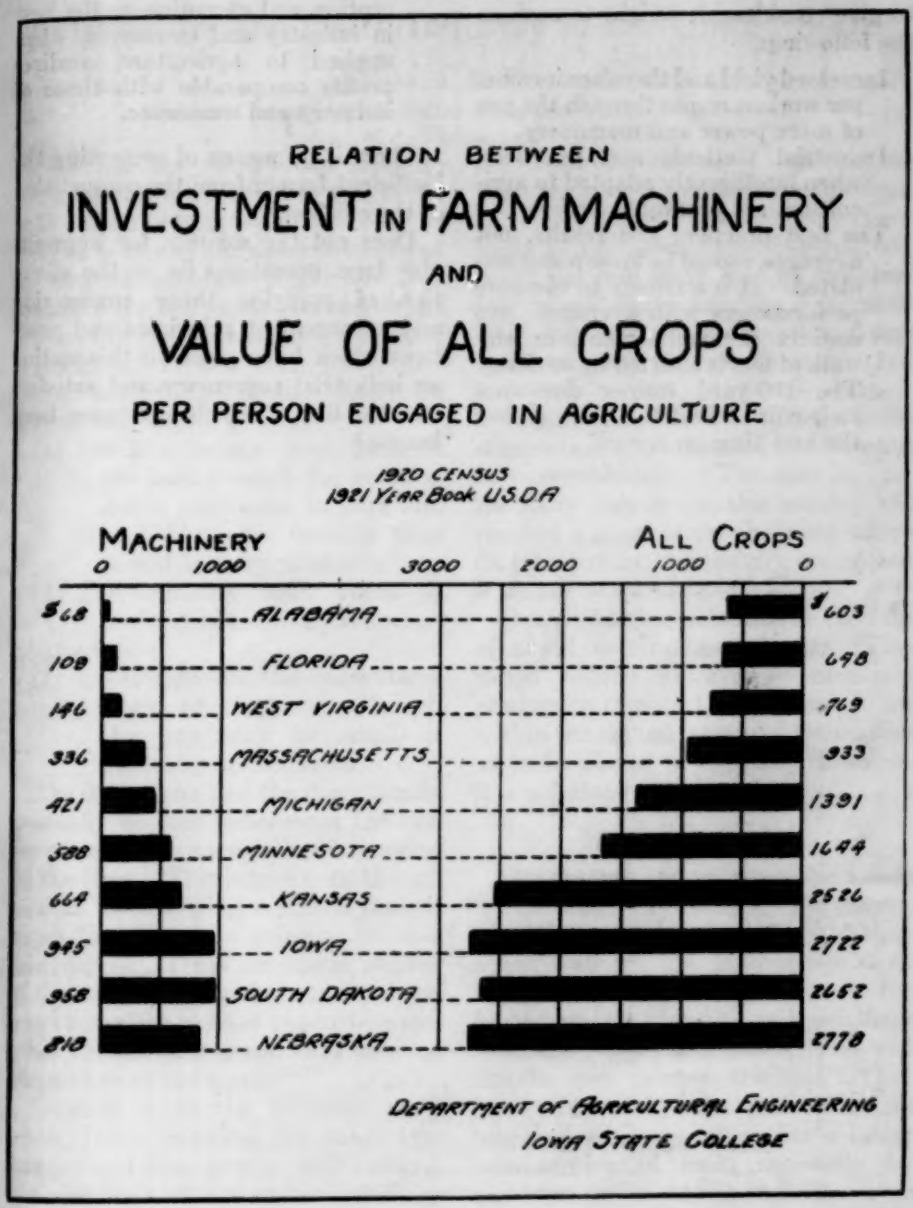
Two general groups of statistics have been given in this article. The first group shows that there is a wide variation in the results being obtained from numerous farm operations. The second discloses that through the application of modern farm equipment and the greater utilization of mechanical and electrical power, marked economies are being realized. The second group, in part accounts for the wide variations of the first group. It is not correct to assume, however, that all of

Chart III




the variations are due to the use of modern machinery and power. Other factors have had their influence. Perhaps the one of the greatest importance is improved farm management. However, it is the better type of farm man-

Chart IV




ager who takes advantage of all improvements available. This type of farm manager is making profits.

The study of such data as are herein presented gives rise to some conclusions. They cannot be said to be wholly accurate because there is not available a sufficient body of data to make that degree of analysis necessary to draw unquestioned conclusions.

There is sufficient evidence, however, to give considerable weight to such as the following:

Increased yield and therefore income, per worker, comes through the use of more power and machinery.

Industrial methods and practices, when intelligently adapted to agriculture, are profitable devices.

The best practices and results, not averages, should be known and emulated. It is a fallacy to compare performances with averages. No distinct accomplishment, in any walk of life, is realized by so doing. The 100-yard runner does not endeavor to beat the average, but the best time on record.

Management, as broad in its conception and execution as the best in industry and commerce, when applied to agriculture, realizes profits comparable with those of industry and commerce.

There is no means of protecting the inefficient farmer from the competition of the efficient.

Does not the solution for unprofitable farm operations lie in the direction of applying those engineering and management principles and practices which have given to this nation an industrial supremacy and satisfaction the like of which has never been known?

# Outlook for the Dairy Industry in the United States

By Dr. A. F. Woods

Director of Scientific Work, United States Department of Agriculture

THERE are always two sides to every question and it is well to see both before passing judgment.

That is true of the dairy industry at the present moment. Right now it is probably the best-organized and on the whole the best-managed branch of agriculture. It has been most consistent in showing a profit. There are several well-known reasons:

(1) Fertility largely goes back to the land through the manure. Feeds purchased in part add probably more fertility than is sold in dairy products.

(2) The monthly milk check is useful if not entirely remunerative.

(3) Everybody on the dairy farm works all the time. Though the pay may be small, it gradually accumulates.

The dairy farm and the dairy family gradually become richer—not too rich nor perhaps rich enough, but improving all the time. This is true even though modern bookkeeping methods show a paper loss, based on going wages and sale values. These economic studies of the dairy business have pointed out ways to reduce costs of production and other sources of loss and thus increase the margin of net profit.

Looking upon the industry as a whole for a moment we may ask: Are we not now pretty well meeting the demands of consumers of dairy products? We still import some butter and cheese and, along the borders, some fluid milk. On the whole consumption is still somewhat ahead of production. It has been estimated that we produce the requirements of our people for 363 days. All that we need to import is enough for *two days*. If consumption should drop very slightly or production increase we could not only take care of ourselves but might easily produce a surplus. This does frequently happen in many markets, producing a disastrous fall in prices.

It is evident therefore that too great stimulation of production would result in overproduction. The fact is that the dairy industry in this country has reached a stage of development where its future must be carefully considered if we are to avoid trouble.

Our population increases at the rate of about two millions a year. This would require an average increased production of only 1.6 per cent—so far within the annual margin of fluctuation as to be almost negligible. However, it is a factor to be considered.

## Health Essential

Our doctors and nutrition specialists tell us that on the average the American public does not consume more than about half of the fluid whole milk necessary to the maintenance of the highest degree of health and resistance to disease, especially tuberculosis and rickets and related troubles. They have shown by demonstrations in many of our large cities that a larger consumption of milk, especially by children, is highly beneficial. This has become so well established that educational programs are being organized in many cities for the purpose of educating the people on the health value of proper diet and the value and importance of pure milk. This is

resulting in gradually increased consumption, not only of milk, but of other valuable food products properly balanced in the diet. A healthy, vigorous person needs more food and eats more and accomplishes more work than one not so healthy and vigorous. It pays, therefore, all around to make and keep people healthy.

The National Dairy Council has been organized to develop this phase of the work. If we would increase consumption to somewhere near the theoretical limit of efficiency it would open up a large field for the dairy industry.

As the food and health value of dairy products becomes better understood in other parts of the world not now well supplied, an increased foreign demand for them will take place. Butter, cheese, condensed milk, and milk powder in which the valuable vitamins have been preserved by proper manufacturing processes, will find their way into places where they are now not used and where they are not likely for various reasons to be produced locally. This will form a gradually increasing outlet for a large volume of milk. The increased demand from these various sources will not be rapid.

### DEMAND FOR HIGH QUALITY

There is one other highly important factor from the standpoint of consumption that must be considered by producers, that is the rapidly increasing demand for *high quality*. First, from the standpoint of purity, consumers demand clean milk. The conditions under which it is produced must be sanitary. The requirements for producing sanitary, clean milk have been pretty well established and are quite well enforced by enlightened communities. The question of enforcement is as important to the producer as it is to the consumer. If the producers are put to large expense in meeting sanitary requirements they should not be required to compete in the same market with those who are not taking these precautions. When milk is brought in to carefully controlled markets from outside territory where sanitary conditions of production are not enforced the consumers as well as the regular controlled producers for that market are being unfairly dealt with.

Milk produced under dirty conditions from diseased cows cannot be made clean and sanitary by pasteurization or by any other process. It may be made somewhat safer by these processes, but no one who knows anything about food wants to consume cooked filth. Health officers who permit it should be fired from their jobs. They are not safe conservers of public health. They simply work into the hands of those fraudulent members of the business who want to freeze out the producer on the one hand and hold up the consumer on the other.

Producers are now organizing with the coöperation of intelligent health officials to produce under carefully controlled sanitary conditions pure milk of high quality at the lowest possible cost to the consumer. They must be encouraged and protected in the effort if the public wants pure milk at low cost. This applies to cream, butter, and other dairy products, as well as to market milk. High quality cannot be produced from materials of *low quality*. High quality sells itself. Experiments have shown that consumers of dairy products will on the average use 20 per cent more of high quality than they do of slightly lower grades. This is more than enough to pay the added cost of producing them. Producers therefore should complain only when these necessary regulations are *not enforced*.

### IMPORTANT POINTS IN PRODUCTION

Now from the standpoint of production, there are some important points to be considered. First, in the interest of pure milk, diseased animals should be disposed of as quickly as possible. This applies especially to tuberculous animals present in many communities in greater or less numbers, varying from 3 to 50 per cent and over. Something over half the dairy cattle of the United States have passed one successful test and nearly 2,000,000 are fully accredited, having not more than ½ to 1 per cent reactors. The work of eradication is progressing as rapidly as practicable. It is safe to say that this disease will be under satisfactory control within a decade.

Thousands of cities now permit milk to be sold only from herds free from tuberculosis. The number is increasing rapidly. This is in the interest of the careful producer as well as the consumer and will have its effect in preventing a too rapid expansion of the industry.

The disease known as *contagious abortion* is another handicap to the industry. These aborting animals are unprofitable and dangerous to the health of the herd, as well as to the community. Reactors must be separated from the healthy animals until they have fully recovered. The worst cases become non-breeders, which of course eliminates them. There is much yet to learn about this disease. It probably causes as great if not greater loss than any other disease of cattle.

At the present time there are about 22,000,000 dairy cows in this country. The average milk production of these cows is about 4,500 pounds a year. Investigations made by the Bureau of Dairy Industry indicate that one-third of our cows, or over 7,000,000, are producing at a loss. This one-third of course does not average 4,500 pounds but probably around 3,000 to 3,500. These low producers should be eliminated as rapidly as possible through the aid of cow-testing associations.

The greatest progress in the dairy industry lies not in increasing the number of dairy cows, but in increasing the production per cow. It has been shown that the highest producing cows yield greater profits over cost of food and maintenance than do the low producing cows. McDowell has computed the records of more than 100,000 yearly individual records from cows on tests in dairy herd improvement associations. The cows that produced 100 pounds of butter fat a year brought in an average income of $14 over cost of feed. Those that produced 200 pounds brought in an income of $54 over cost of feed; those producing 300 pounds, $96; those producing 400 pounds, $138; and those producing 500 pounds, $178. Thus for every 100 pounds gain in butter fat there was a gain of $40 over cost of feed.

The cows on test in the dairy herd improvement associations in the United States in 1927 averaged 7,410 pounds of milk containing 293 pounds of butter fat. The tested cows, therefore, produced a little more than 60 per cent more milk and butter fat per cow than was produced by the average dairy cow. This increased production was largely due to closer culling, better breeding, and intelligent breeding as practiced by the dairy herd improvement associations. If all our dairy cows produced as much as those on test in these associations we could dispose of one-third of them and still maintain our present supply of dairy products at an enormous saving in feed, stable room, and labor.

Elimination of low producers is an easy and inexpensive proposition. It is estimated that the 1,000 associations

now in operation in the United States have saved or increased their net profits by $20,000,000 a year largely through culling.

Breeding from meritorious proved sires can easily double this figure or bring it up to $40,000,000 a year. Long before selection, feeding, and breeding can reach perfection the results of the work of these 1,000 associations may easily add $10,000,000 more to this yearly income over cost of feed. The total will then be $50,000,000 a year.

But this is only the beginning of the story because these 1,000 associations are testing only 2 per cent of our dairy cows. The day will come when there will be at least ten times that many under test, with a saving of $500,000,000, and this would be easily doubled with a saving of a billion dollars a year.

Twenty-nine of these associations are in Ohio.

Last year the cows on test in Ohio associations averaged 313 pounds of butter fat per cow, exactly 20 pounds per cow above the average of all the cows on test in the dairy herd improvement associations in the United States. Who likes to milk so well as to milk and care for twenty common cows when he could make more money by milking and caring for ten selected high-producing cows!

Along with this program of weeding out low-producing cows comes the weeding out of *scrub bulls*. They are largely the cause of having so many low-producing cows. About three-fourths of the bulls used in the United States are scrubs. These should be replaced as rapidly as possible with pure-breds that have shown ability to raise the herd to average producing power. It is comparatively easy to increase production when the herd average is under 300 pounds of butter fat. It requires more careful breeding and selection to raise to 400 or 500 pounds. Low-producing pure-breds should be weeded out the same as scrubs. About one-third are of no value.

Denmark has increased its herd average through cow-testing associations up to 8,700 pounds in 1927. The aim is to average 4 per cent butter fat. When we reach the efficiency of Denmark we can produce all the milk we consume with one-half the number of cows we now use and at least double the profit. This can never be accomplished except by organization along coöperative lines. Here again careful scientific and business principles must be applied. Each organization must be developed for a definite purpose if it is to function efficiently and satisfactorily.

Under existing law producers can now organize to control their own business. Consider the great coöperatives in Minnesota, the Dairymen's League Coöperative of New York, the Maryland State Dairymen's Association, and hundreds of others. These associations are built on quality and reliability. They pool their products and are in position to make a fair bargain as to price and to do it legally. They are no longer told how much they can have for their products, but in coöperation with the buyers they fix their price according to market conditions.

## THE FUTURE

Thus a new day has dawned for the dairyman. If he looks ahead and plans and coöperates with his neighbors and utilizes the knowledge that is available to him he may look ahead indefinitely to a stabilized, profitable industry and to rendering a service to his fellowmen second to none.

Our dairymen are entitled to full tariff protection so long as we produce

less milk than we consume. But in the trend of increasing production dairy plans should be so made now as to face the day when we must through exports meet the world market for our surplus be it seasonal or annual. The alternative is to limit our total production to our total domestic consumption.

# What the Agricultural Extension Service Has Done for Agriculture

M. S. McDowell

Director of Agricultural Extension, Pennsylvania State College

WHAT is Agricultural Extension work? What is the character of the organization? What is the program and how is the program developed?

Answers to these questions should precede a discussion upon the subject of this paper, and indeed these answers may in themselves throw a great deal of light upon "What the Agricultural Extension Service Has Done for Agriculture."

Because of small units working under a wide range of conditions, inability to employ scientifically trained personnel, supply laboratories and equipment, and other factors, it is impossible for the farmer to conduct research work. In the interest of the people as a whole, however, it is vital that such work be done. The only way it can be done is with public funds and under public supervision.

The research activities of the United States Department of Agriculture, the State Agricultural Experiment Stations and other institutions and organizations which have been under way for many decades have developed a large amount of scientific information which has a very practical application to the improvement of farm practices.

Principles underlying the maintenance of soil fertility, the development of improved crop varieties, the control of plant diseases and insects, the breeding and feeding of animals, and other phases of agriculture, as well as those principles which have to do with the marketing and distribution of the products of the farm, have been studied. Much valuable information is available concerning human nutrition and other problems which vitally affect health and home.

The problem of distributing and applying this information to the farm and farm home is difficult. With more than six million farms in the United States, each an individual unit with a separate and independent manager, it is necessary to reach a large number of units with managers of varying degrees of skill. These farms are located from coast to coast and from Canada to the Gulf of Mexico. Therefore, available information must be applied under a great range of conditions. Furthermore, it is not possible to control conditions as may be done under factory production. The weather, a factor which no one can control, contributes to the hazard of farming. Application of the best principles is valueless when unfavorable seasonal conditions or sudden storms are encountered.

These very factors emphasize all the more, however, the necessity for the general adoption of methods or practices which have been shown to give results from the standpoint of net returns to the farmer.

The Agricultural Extension Service is the channel through which the information accumulated by research agencies may be distributed and applied to farm practices.

## Agricultural Legislation

The Land Grant Act, passed by Congress in 1862, established the Agricultural Colleges and provided the

foundation for the teaching of Agriculture. As these Agricultural Colleges developed it was soon discovered that worth-while teaching required a continual study of underlying facts and principles. Congress recognized this need and in 1887 enacted legislation which resulted in the establishment of Experiment Stations in the several states in connection with the Agricultural Colleges.

In 1914 the need for a third phase of activity, that of carrying accumulated information to the farmers, was recognized, and the Smith-Lever Act was passed by Congress.

In the words of this Act, Agricultural Extension is defined as follows:

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It shall consist of the giving of instruction and practical demonstrations in agriculture and home economics to persons not attending or resident in said colleges in the several communities, and imparting to such persons information on said subjects through field demonstrations, publications and otherwise.

Obviously, therefore, Extension work is for the dissemination of information and must be educational in character.

Under the Smith-Lever Act the responsibility for the administration of funds for this purpose is placed upon the Agricultural Colleges in coöperation with the United States Department of Agriculture. The States must match the funds appropriated by the Federal Government. It also specifically includes the problems of the farm home along with those of the farm.

This legislation was not made in the interest of the farmers alone; but because its results would be helpful, directly and indirectly, to the whole people. There can be no justification for the expenditure of public funds, Federal, State or local, if such expenditure is not in some way in the interest of all of the people.

## EXTENSION ACTIVITIES

The impression persists that "educational work" means more production without regard to other factors which necessarily influence production; that the securing of better markets and fairer prices is in no way connected with an Extension program. This view is erroneous.

Reducing the unit cost of production through the application of better practices and securing an adequate and just price for the article produced are vital factors of interest to both producer and consumer. Both of these factors are susceptible to the application of educational methods and come within the province of Extension activities. The Extension Service, however, is advisory in character and does not represent the managership and direction which would undertake to act as the purchasing agent for the fertilizer or other supplies needed by the farmer, or as the selling agent to dispose of the wool, milk, potatoes or any other product, any more than it would undertake to cut and put into the barn the alfalfa which might be grown under its advice and with its assistance, or to milk the purebred cows which might have been purchased as a result of educational activity looking toward the use of better and more efficient livestock machinery. The relation of Extension activities is the same to both propositions; that is, advisory. It is its function to encourage and advise existing organizations and to foster the formation of new organizations for specific purposes where needed. Commercial and business transactions, as such, should be carried on by the people themselves through channels developed for that purpose.

A business transaction, whether it be buying supplies or selling a product, is not a remunerative proposition unless

it pays all the expenses involved and leaves a profit. It is manifestly improper that the overhead expenses of a business transaction should be paid from public funds. A field operation or demonstration that could show results in more economical production only by having an Extension employee do the actual work of sowing the seed, applying the fertilizer, operating the spray machinery, harvesting the crop, etc., would certainly not be recognized as a legitimate piece of Extension work.

Similarly, a commercial transaction that can show a saving only because the members of the Extension Service or some other public agency perform some of the necessary functions in the transaction cannot be considered a legitimate undertaking to promote. It is not the function of the Extension Service to engage in commercial transactions.

The making of more money for the farmer should and will be an important result but, in general, the primary business of Extension is to furnish information, the application of which will bring about that result.

In a few words, then, Agricultural Extension aims to assist the farmer and his family to do those things which are practically the only things which they can do to improve their own situation.

In the organization of Agricultural Extension work the county agent, the Extension specialist, and the local people must all be considered as responsible for the development of the program.

## EXTENSION TEACHING

Systematic and continuous contact with a community, a knowledge of local conditions and needs, personal acquaintance in the community and ability to organize the forces of the community are requisite to the application of Extension teaching. The county has been adopted as the geographical unit. The requirements mentioned are secured through the county agent, who is a permanent resident of the county with headquarters at the county seat, and who is selected because of his peculiar fitness for the position. A trained Home Economics worker meets these same requirements in the application of Extension teaching, as it touches the management and conduct of the home.

It is self-evident that no individual could be found who could combine a well-rounded knowledge of all of the various subjects which are brought to play in the operation of the farm. Backing up and supplementing the county agent are such specialists as the needs require, with headquarters at the Agricultural College. They furnish the technical information as well as help to give inspiration to the farmers of the county. These specialists, being in close contact with the Experiment Stations, keep up to date on the results of current research which may have a helpful bearing on farm and home operations.

One of the most vital factors in the system is the part which the local people themselves take in the development and conduct of an Extension program. This is accomplished through a county organization which coöperates with the county agent and the Agricultural College. This organization is responsible for securing the local funds, either from the county treasury or otherwise, which are necessary in addition to Federal and State appropriations which come through the Agricultural College.

Careful planning of the work to be done together with the establishment of definite aims and purposes are essential to obtaining satisfactory and progressive results. It is also neces-

sary that the people of a community assume some responsibility in connection with carrying out of community projects.

The term community as used in this connection cannot be clearly defined. A community represents a territory which has a common trading center, or some other point in common, and may cover a considerable area. For instance, there might be one or more schools in one community. The major problems and type of agriculture should also be common to all farmers included in a community. Group action is sometimes necessary. These factors, therefore, help to determine community boundaries. At the present time, in some counties where the natural community boundaries are not so distinct, townships are used as community units.

### DEVELOPMENT OF PROGRAMS

In the development of an agricultural program the county agent meets with a community group, usually six or eight persons, or a general community meeting is held. The problems of the community are discussed from the community standpoint rather than from the viewpoint of the individuals present, and a few of the more important lines of work, not more than three or four, are selected for the year's efforts. One interested farmer is chosen as local leader of each project selected. This leader is responsible for securing a place to put on the demonstration, for keeping the county Executive Committee and the county agent informed of the progress and needs of the project, and for "boosting" this work in his community.

For instance, if dairying is a major activity in the community, the weeding out of poor cows, which may involve cow-testing associations, would constitute one item in the program. The use of better sires, possibly through the organization of bull associations by means of which a group of farmers, working coöperatively, may secure the use of better bulls than would be possible for the individual to secure, might be another phase of the dairy program. Better and more economical feeding methods may be studied, as well as problems which have to do with the production of a better, cleaner and more wholesome product. A similar plan is followed with other livestock, poultry, farm crops, etc.

Local women act as leaders for the Home Economics phases of the work and these programs are developed in the same manner as are the agricultural programs.

The sum of these community programs constitutes the county program. In addition to this systematized program, information and help are given to persons in the solution of individual problems in so far as time and circumstances permit.

The Federal Department of Agriculture reports that 58,000 rural communities throughout the United States put on various demonstrations of better farming or home making methods in 1927.

It is difficult to find a unit of measurement which will express in definite terms what results have been secured from the operation of the Extension System outlined.

### EXAMPLES OF ACCOMPLISHMENT

Probably the people of a county or of a community have a general idea of the value of what has been done, but even they might find difficulty in expressing it in concrete terms. A few examples of specific accomplishments may serve to give an idea of what this work has meant to the farmers. While the following examples are taken from Pennsylvania's records,

the illustrations apply to the country as a whole.

The average production per cow is about 4,000 pounds of milk and 160 pounds of butterfat. A cow-testing association consists of a group of about 26 farmers who work coöperatively in employing a capable man who spends one day each month on the farm of each member, weighing and testing the milk from each individual cow in the herd and weighing and checking on the feed. At the close of the year, the farmer is given a statement showing the cost of feed and production for each cow in his herd. Unprofitable cows may be discarded. Last year in Pennsylvania, which has 65 cow-testing associations organized through the efforts of the Extension Service, the average production per cow was 7,700 pounds of milk and 300 pounds of butterfat.

In other words, if the average production per cow in the State equalled the average production of the cows in the cow-testing associations, the same amount of milk as is now being produced could be obtained with one-third fewer cows. This means a lower unit cost of production.

In the same way a group of farmers coöperates in the organization of a bull association, thus making it possible for an individual farmer to have the use of a good bull, which the size of his herd would not justify as an individual proposition. The daughters of such bulls are superior to their dams. Actual records from 48 association bulls show an average increase of 28 per cent in milk production and 13½ per cent in butterfat production of daughters over dams, all records completed to maturity.

The bull associations also have a very important value in making available young bulls of good quality for breeding purposes, as well as making available good heifers for replacing old or low-producing cows and for sale into other herds. Many of these heifers are used in boys' and girls' calf clubs which function in a substantial way in the distribution of good high-producing animals of approved type and breeding.

The educational work of the Extension Service in connection with the elimination of tuberculosis from the dairy herds in order to insure a healthy and safe milk supply has been a very distinct and important contribution, not alone to the dairy interests but to the country as a whole.

During eight years of poultry improvement through demonstration farms the average egg production per hen on these demonstration farms has been increased from 120 eggs to 148 eggs per year. Through culling demonstrations for a similar period the number of non-laying hens in the flocks has been reduced from 34 per cent to 11 per cent.

Since 1919, through the use of good rams, proper preparation of clip, culling out poor ewes, more intelligent feeding and housing, and through grading demonstrations sponsored by the Extension Service, "off grade wools or rejects" have decreased from 12.7 per cent to 3.3 per cent.

For the potato growers, proper preparation and fertilization of the soil, standardization and adaptation of varieties, the use of good seed free from disease, and proper spraying have done much to increase the yield per acre and thus reduce the cost per bushel.

Other illustrations including all phases of agriculture might be given, but the foregoing are probably sufficient to indicate the general results of that phase of the work. The examples given deal with production. However, the reduction of the unit cost of production is one of the most

important ways in which the farmer has adapted his business to meet the difficult economic problems which have confronted him during the last eight years.

### PROBLEMS OF DISTRIBUTION AND MARKETING

Distribution and marketing need to be given consideration. In many, if not in most, instances, the problem of marketing, in so far as the farmer himself can affect it, is so closely allied to production that the two cannot be separated. For instance, the problem of marketing may involve a readaptation of the character of his agriculture better to meet the requirements of a market. It may mean the production of a uniform product in a community or a product of higher quality or better grading and packing in order to meet competition or, again, it may mean that the conditions require a group of farmers to work together in the organization of coöperative associations for the conduct of certain phases of their business.

The Extension Service gives information and assistance on all of these problems. In this connection, we quote from a recent report of the United States Department of Agriculture:

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Extension activities in marketing carried on by 1,455 Extension agents influenced 424,025 farmers to improve their marketing practices. Assistance in placing marketing on an organized basis was given 926 new coöperative associations and 2,180 associations previously organized were assisted in solving management problems. The value of business reported by these coöperative associations during the year was valued at $232,340,696 with an estimated profit or saving of $16,477,578.

The subjects of farm bookkeeping and of dependable records are among other important lines along which assistance has been rendered.

### EXTENSION WORK IN HOME ECONOMICS

After all, the home on the farm is more important than the farm itself, which is the means of support for the home. A word should be said regarding the Extension work in Home Economics.

Demonstrations are given in the selection, preparation, and serving of wholesome foods, including information concerning the important relation which exists between diet and health. Clothing, home management, house furnishing, sanitation and health, water supply in the home, improvement of the farm home grounds, and social activities are also items which are included in the programs to be stressed.

There are ways in which Extension activities have rendered, possibly, a more far-reaching service than in case of the more direct help heretofore outlined.

The social and spiritual side has been given a distinct impetus. Farmers working together coöperatively in a small way on production problems are gaining new insight into the importance and possibilities of future coöperation. Practice in coöperation is as essential as experience and practice in many other of their activities. A community conscience, which is an important factor in any forward movement of this kind, is developing.

The more than 243,000 local rural leaders of the United States who cooperate with the Extension Service in the arrangement and conduct of community programs for the advancement of agriculture, and who serve without financial remuneration, cannot help but wield an influence of increasing helpfulness.

Farmers as a whole are coming more and more to appreciate the fundamental fact that, after all, the interest of all groups of our people is mutual. The

agricultural people today appreciate the necessity for efficiency. This is evidenced by the fact that American farmers produce more per individual than do any other farmers in the world.

Finally, the farmers of this country are thinking of their own problems with a background of knowledge of fundamental principles, rather than in terms of legislation or other outside help.

All of these things make the agricultural outlook hopeful and, while Agricultural Extension has made distinct contribution to the progress of the past, the future offers a challenge for a larger service.

# The Economic Significance of Commercial Fertilizers

By J. G. Lipman
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COMMERCIAL fertilizers began to assume economic importance after the middle of the nineteenth century. Prior to that time attempts were made to maintain yields by various expedients. The experiences of farmers, both old and new, seemed to indicate that land in use for any considerable length of time gradually lost its ability to produce large crops. The belief thus came to prevail that land needed a rest from cropping; hence, the so-called practice of "fallowing." In the eighteenth century the three-field system was widely adopted in Western Europe as well as in the older portions of the United States. Under this system, the farm area devoted to crops was divided into three portions—one part was used for the growing of a winter grain crop; one part for the growing of some spring crop, and the third part was left uncropped, but was tilled for the sake of controlling weeds and keeping the texture of the land in a satisfactory condition.

## Early Use of Fertilizers

The three-field system is still in vogue in Eastern Europe and in other regions where the more primitive types of agriculture prevail. It is a system of land exploitation where fallowing—that is, resting the land—merely delays agricultural bankruptcy. Recognizing this fact, the more intelligent farmers stressed the importance of livestock keeping. Animal manures were regarded as practically indispensable for keeping up yields. Meadow lands were highly prized because they permitted the maintaining of a large number of farm animals. The fertility of the lowlands was depended upon to maintain the fertility of the uplands. Farmyard manure was more or less carefully conserved by being protected from leaching and too rapid decomposition. Its quantity was increased by the use of generous amounts of bedding, such as straw, spoiled hay, leaves, pine needles, peat, moss, etc. It was often mixed with muck, peat, mud and miscellaneous refuse materials of vegetable origin for the sake of increasing the supply of crude fertilizer. Such mixtures are known as "composts" and are still extensively used in some countries.

The value of lime for improving soils and increasing crop yields has been known for many centuries. The empirical practice was well justified by the results obtained. So-called "lime marls," containing from less than 10 to more than 50 per cent of calcium carbonate, were extensively employed and are still so employed in many places. Where lime was used, clover and other legumes could be more easily grown, pastures and meadows were improved and the ability of the land to support livestock made more pronounced. Where lime was used for cultivated crops, certain undesirable effects became apparent in the course of time. Farmers began to speak of "overliming" and the damage caused by frequent and excessive use of lime.

In the light of modern knowledge, we know that lime, whether applied as ground limestone, finely ground-burned lime, hydrated lime or lime marl, will stimulate the activities of soil bacteria, the decomposition of vegetable matter in the soil, and the solution of some of the mineral ingredients. Thus, the

supply of available plant food from the natural resources of the land will be temporarily increased. We recognize, therefore, that lime, improperly used, is only a means of hastening the exploitation of the plant-food resources of the soil.

Other materials—like greensand marls, peat and muck—were used extensively prior to and during the eighteenth century. They were crude materials containing relatively small proportions of plant food, but, when used in sufficiently large quantities, were able to increase to a more or less substantial extent the ability of the land to produce crops. Other low-grade materials—such as woolen rags, sod, spent hops, hair and wool waste, refuse, salt and numerous other products—were employed as a means of improving the land. The low cost of labor and the lack of more efficient fertilizers seemed to justify their use. At best, however, their supply was quite limited, and it was only in the case of marls, peat, and peat and marl composts where the quantity available was adequate. However, even with low labor costs, they could not be widely used in large amounts except where the fields were favorably situated as to the source of supply.

## CHANGES IN THE RECENT CENTURIES

Thus, we find that the depressed state of European agriculture during the Middle Ages showed scant improvement until the eighteenth century. The introduction of clover in Western Europe, the better care of the grasslands, the use of lime and marl, the conservation of manure, the preparation of composts and the carrying of larger numbers of farm animals all tended toward a higher level of production per acre. Progress was slow, nevertheless, because of the relatively crude character of the fertilizer materials available in those days. It was only the more progressive farmers, favorably located, that were able to bring their lands up to a high state of fertility.

With the beginning of the nineteenth century, the way was paved for the use of products which may be legitimately included among the so-called "commercial fertilizers." The use of animal bones was not entirely new, but the supply became more ample early in the nineteenth century, and farmers began to appreciate the value of grinding bones for the sake of increasing their efficiency as a fertilizer.

In the third decade of the nineteenth century guano from certain islands located off the coast of Southwestern America began to be imported into Europe and the United States. Rather extensive deposits of this material had accumulated from the droppings of birds nesting on these islands. Very large quantities of bird guano were thus brought to Europe and North America during the period 1830 to 1870. Their use served an important purpose in demonstrating to landowners that small quantities of some materials have the ability to produce crop increases very much out of proportion to their bulk. The use of guano helped to bring about an understanding concerning the factor of concentration in fertilizers. One or two hundred pounds of guano often produced much better results than five or ten loads of farmyard manure.

In the third decade of the nineteenth century a beginning was made also of importations of nitrate of soda from Chile and Bolivia. This salt—extracted from the hardened earth of desert areas in these countries—was used with varying success by farmers in Great Britain and other countries. At times the results obtained were strikingly beneficial: at other times the

material seemed to injure rather than help the crops. Scientific research ultimately accounted for these abnormalities. At this time it is sufficient to say that bones, guano and nitrate of soda were the forerunners of present-day commercial fertilizers. Their use taught farmers the specific effects produced by some materials and the significance of concentration as bearing on the value of fertilizer materials.

### PRESENT-DAY SOURCE MATERIAL

Toward the middle of the nineteenth century, there came a clearer understanding of the function of various ingredients in the feeding of plants. It was recognized that bones and mineral phosphates were valuable because they furnished the element phosphorus; nitrates, because they furnished the element nitrogen; wood ashes, because they furnished potassium and calcium and some phosphorus. The effectiveness of guano was explained by its content of various nitrogen compounds and of phosphates. Similar information began to be developed concerning the function of other plant-food ingredients, among them, sulphur, iron and magnesium. A search was made for sources of phosphorus, potassium, nitrogen, sulphur and of other ingredients of possible value in the production of crops.

The record of the second half of the nineteenth century and of the first quarter of the twentieth century is replete with findings and discoveries to which we may justly attribute the establishment and the development of the great chemical industry that concerns itself with the manufacture of commercial fertilizers. It would be sufficient at this time to mention the deposits of phosphate rock in our southern states, particularly those of Florida and Tennessee; the very much more extensive deposits in the West, particularly in Montana, Wyoming, Idaho and Utah, and other deposits in North Africa, the South Sea Isles, Siberia, China, etc.

Similarly, we may consider the deposits of potash-bearing minerals in Germany, France, Poland, Spain, the southwestern portion of the United States, the Red Sea region and elsewhere. Important sources of potash are also found in the Searles Lake region in Southern California and in the brines of various salt lakes. Greensand marls, certain seaweeds, flue dusts, crude saltpetre, waste products of sugar refineries, wool scourings, etc., furnish not inconsiderable quantities of potash to our fertilizer industry. Various rocks and minerals—such as feldspars, leucites, alunite and others—are potential sources of potash.

Pyrites and brimstone serve as a source of sulphur for the manufacture of sulphuric acid and of superphosphates. In the production of coke and the manufacture of illuminating gas, large quantities of ammonia and ammonium sulphate become available as by-products and as a source of raw materials in the manufacture of fertilizers. The production of synthetic nitrogen compounds has changed in a far-reaching way the organization and output of our fertilizer industry. Calcium cyanamid, synthetic calcium and sodium nitrates, synthetic ammonia and various compound nitrogen salts are relatively recent additions to our raw materials for the manufacture of commercial fertilizers. There are still available large quantities of cottonseed meal, of tankage, of fish scrap and of other residual and waste products of plant and animal origin. These and others, in their sum total, represent the raw materials of our fertilizer industry, an industry which is contributing so effectively to changes and adjustments

in agricultural production in different countries.

The fertilizer industry in the United States assembles its raw materials from various sources. Some of these materials are the result of processing. For instance, fish scrap represents the dried residue of fish after the oil is extracted. Tankage is the lean meat containing varying proportions of bone and representing the residue of meat offal and of condemned carcasses of animals after these materials are heated in water, the fats extracted and the residue dried and ground. Similarly, cottonseed meal and castor pomace are the residue from vegetable seed deprived of their oil by suitable methods of extraction. Animal bones are treated with solvents or steam. Refuse animal material, such as leather scrap and hair and wool waste, are mixed with ground phosphate rock and treated with sulphuric acid. The resulting product is known as ammoniated superphosphate. Cyanamid is transformed by suitable treatment into ammonium phosphate, which is sold under the trade name of "Ammo Phos." Ammonia liquor, containing synthetic or by-product ammonia, is used for the manufacture of ammoniated superphosphate.

Other methods of treatment and processing are quite common. The various raw materials and processed products are combined and blended to furnish so-called "mixed fertilizers." These are sold on the basis of their composition and the analyses guaranteed in accordance with provisions of the fertilizer laws enacted in states where fertilizers are of any commercial importance.

The fertilizer analysis represented, for instance, by the figures 4-8-4 indicates a content of 4 per cent of ammonia, 8 per cent of phosphoric acid and 4 per cent of potash. There is a very considerable range in the proportions of nitrogen, phosphoric acid and potash furnished by the numerous brands of mixed fertilizers. In recent years, more concentrated fertilizers have been gaining in favor. They combine a greater number of units of plant food, and, for this reason, are more economical to transport and distribute. It is obvious that a 2-8-2 mixture, furnishing a total of 12 units of plant food, would be more costly to manufacture, transport and distribute than a 15-30-15 mixture, furnishing a total of 60 units of plant food.

### ADAPTION TO NEEDS

Manufacturers of commercial fertilizers try to adapt the various mixtures to the specific needs of soils and crops. Thus, fertilizers sold for use on sandy soils are relatively richer in nitrogen and potash than fertilizers sold for use on the same crops grown on heavier soils and containing a greater reserve of natural fertility. This factor will be referred to again in the following pages.

The regional distribution and use of commercial fertilizers are directly influenced by climate, soil type, the character of the crop and the cost of fertilizer materials on the one hand, and the market prices of farm products on the other. The need for fertilizers is usually more pronounced in regions of high average annual temperatures and of high rainfall. In such regions, the loss of plant food from the soil is greater than it would be in colder or drier soils where bacterial activities and leaching of soluble salts are retarded. Soils of heavier texture not only retain more tenaciously the fertilizer salts applied, but also furnish a greater reserve of natural fertility. Hence, their need for fertilizers develops more slowly.

The commercial value of crops bears a direct relation to the amount and kind

of fertilizers employed for increasing their yields. It is obvious that wheat or corn, representing an acre value of less than $30, will not permit of any large investment in fertilizers. On the other hand, asparagus or celery, representing an acre value of several hundred dollars, will permit expenditures on fertilizers of as much as $50 per acre, or even more. Moreover, the variation in the market price of staple crops, fruits and vegetables will influence the expenditure on commercial fertilizers. When potatoes are selling at $1.00 a bushel, or cotton at 20 cents a pound, a substantially larger investment in commercial fertilizers is justified than when these are selling at 50 cents per bushel or 12 cents per pound, respectively.

Different types of farming create varying problems as to losses and replacements of plant food. Types of cropping as represented, for instance, by the rotation of corn, oats, wheat and timothy and clover encourage an accumulating deficit of nitrogen, phosphorus, potassium and calcium. This type of cereal and grass farming, even when combined with livestock farming, makes it difficult, if not impossible, to maintain crop yields at a high level. In the course of time plant-food deficiencies under such conditions become more pronounced and the need for the supplementary use of commercial fertilizers more pressing.

Inventories of plant-food losses and gains that have been made in various places in the United States show clearly that some adequate provision will need to be made for the use of commercial fertilizers if production per acre is to remain stationary or to rise slowly. The use of commercial fertilizers is also related to earliness and to the maturing of the crop. It has been demonstrated by numerous experiments in the Corn Belt that the use of soluble phosphates is an effective means for ripening corn at an earlier date and for escaping the hazards of frost damage. Commercial fertilizers, properly used, permit the ripening at an early date of vegetables and the bringing of these to market when price levels are still relatively high. There is, furthermore, a relation between the kind and amount of fertilizer used, on the one hand, and the resistance of crops to disease and their edible quality, on the other.

Any attempt to define fertilizer practices in any soil or climatic region must reckon with limiting factors in crop production. For example, a soil may contain an adequate supply of available plant food for a 30-bushel crop of wheat, but, if the prevailing range of rainfall and temperature are sufficient for only 20 bushels of wheat per acre, the maximum yield is determined by this last named factor. Similarly, if climatic factors would permit a maximum production of 30 to 40 bushels of wheat per acre and the supply of nitrogen or phosphorus of only 15 bushels per acre, the maximum yield will be limited by the supply of these constituents. It is obvious, therefore, that in some of the agricultural regions of the United States plant food has not yet become the limiting factor. In these regions the control of soil moisture, the improvement in soil texture, the neutralizing of soil acidity or the introduction of superior types of crop plants must receive primary consideration.

As time goes on, the natural reserve of plant food in the soils of these regions will call for supplementing by means of commercial fertilizers. This is clearly borne out by long-term fertilizer experiments in the United States and in other countries, as well as by soil and fertilizer practices in Western European countries.

A study of crop statistics of different

countries will show that in some countries, like Russia, yields per acre are very low. In the case of wheat, the average is less than 10 bushels per acre. In Western Europe crop yields were distressingly low during the Middle Ages. A marked rise in yield levels did not occur until after the middle of the eighteenth century, and the high levels which are now common in the Scandinavian countries, Belgium, Holland, Germany and England, did not become well established until well toward the end of the nineteenth century. It is only in the case of England and Scotland that careful attention to soil needs, progressive methods of livestock farming and the use of suitable rotations, legumes and lime that yield levels rose markedly by the middle of the nineteenth century. In most of the western European countries notable increases in yields per acre did not become apparent until the beginning of the present century. Germany, Holland and Belgium may be cited as notable examples in this connection. At the present time, the yields of wheat and potatoes per acre in Germany are approximately twice as high as they are in the United States when the average for the entire countries is taken.

### CROP YIELDS AND PROFITS

There is a more or less direct relation between crop yields and profits. This is well brought out by figures gathered by Hinkle. He shows that corn growers in Illinois, when grouped in accordance with their average acre yields of 30, 40 and 50 bushels of corn, had an acre production cost of $21 in the case of the 30-bushel crop; of $21.70 in the case of the 40-bushel crop, and of $27.40 in the case of the 50-bushel crop. The difference between the highest and the lowest yields just noted, namely, 20 bushels per acre, represents an increased cost of only $1.40. Similarly, statistics gathered in Ohio show that a 40-bushel crop of corn gave only a 2.2-bushel profit. A 65-bushel crop gave an 18-bushel profit. In other words, the 40-bushel yield paid 5.5 per cent, while the 65-bushel crop paid 27.75 per cent profit. Records of the same nature gathered in Indiana confirm the above conclusion.

There is ample evidence to show that the intelligent use of fertilizers will return substantial profits and lower the cost of production per unit of any crop commodity. Thus, in experiments carried on in Virginia with tobacco it was shown that "the five-year average yield of unfertilized tobacco was 195 pounds per acre: the profits $12.59. The average yield from land receiving 800 pounds per acre of a 3-8-3 fertilizer was 670 pounds, and from 1,400 pounds application, a yield of 934 pounds of tobacco was secured; the proceeds being $94.27 and $135.58 respectively." Additional evidence of a like character may be furnished from New York, Pennsylvania, New Jersey, Georgia, and, in fact, from almost any state where commercial fertilizers are used more or less extensively.

The question of the relation of fertilizers to unit costs of crops has been extensively studied and discussed by Lemmermann in Germany. In comparing fertilizer costs and crop values in pre-war and post-war periods, he shows that a unit of any crop commodity will now purchase a greater amount of fertilizer than a corresponding unit purchased in 1913. Seven staple crops —including rye, wheat, oats, barley, potatoes, turnips, and hay—show a market value in 1928 of from 110 to 144 as compared with the corresponding prices designated at 100 for the year 1913. A similar comparison of fertilizer prices shows that in 1928 the cost of nitrogen in different nitrogen salts ranges from 67 to 90 when the corre-

| States | Change Per Cent | 1926 | 1925 | 1924 | 1923 | 1923 | 1921 | 1920 |
|---|---|---|---|---|---|---|---|---|
| NEW ENGLAND | −1.3 | 363,920 | 368,656 | 364,404 | 350,709 | 347,486 | 314,388 | 351,421 |
| Maine | 3.8 | 192,000 | 185,000 | 182,000 | 168,000 | 172,000 | 151,375 | 168,000 |
| New Hampshire | .... | 16,000 | 16,000 | 16,000 | 17,000 | 15,000 | 14,000 | 17,000 |
| Vermont | .... | 18,000 | 18,000 | 17,000 | 18,000 | 16,000 | 15,000 | 20,000 |
| Massachusetts | −0.6 | 58,920 | 62,656 | 61,968 | 63,709 | 65,986 | 61,013 | 61,421 |
| Rhode Island | .... | 9,000 | 9,000 | 8,800 | 9,000 | 8,500 | 9,000 | 10,000 |
| Connecticut | −10.3 | 70,000 | 78,000 | 78,636 | 75,000 | 70,000 | 65,000 | 75,000 |
| MIDDLE ATLANTIC | −3.3 | 1,059,222 | 1,095,288 | 1,024,947 | 1,073,338 | 1,083,237 | 1,016,165 | 1,237,944 |
| New York | −9.8 | 338,250 | 375,000 | 375,000 | 375,000 | 350,000 | 325,000 | 385,000 |
| New Jersey | .... | 146,687 | 146,687 | 152,827 | 157,497 | 176,424 | 163,487 | 164,821 |
| Pennsylvania | −1.2 | 330,000 | 326,121 | 319,685 | 308,742 | 322,210 | 321,284 | 332,926 |
| Delaware | −2.5 | 40,000 | 41,006 | 36,224 | 36,931 | 40,344 | 37,472 | 61,735 |
| Maryland | −1.3 | 163,285 | 165,474 | 151,211 | 155,168 | 156,188 | 140,052 | 172,410 |
| West Virginia | .... | 41,000 | 41,000 | 40,000 | 40,000 | 38,071 | 28,870 | 121,052 |
| SOUTHERN | 1.3 | 5,149,985 | 5,082,439 | 4,602,186 | 4,337,603 | 3,617,035 | 2,912,313 | 4,944,224 |
| Virginia | −3.6 | 435,223 | 451,656 | 441,895 | 422,350 | 449,942 | 369,490 | 465,247 |
| North Carolina | 0.02 | 1,218,176 | 1,217,822 | 1,183,053 | 1,066,553 | 951,174 | 690,544 | 1,170,440 |
| South Carolina | −3.9 | 840,128 | 873,255 | 844,440 | 693,386 | 526,599 | 508,893 | 1,098,487 |
| Georgia | 0.5 | 780,202 | 778,808 | 678,959 | 675,867 | 521,547 | 535,638 | 1,003,053 |
| Florida | 11.2 | 398,480 | 358,463 | 365,317 | 398,564 | 353,769 | 290,618 | 262,061 |
| Alabama | 2.9 | 615,364 | 598,115 | 456,840 | 447,913 | 284,370 | 168,239 | 374,866 |
| Mississippi | 7.8 | 278,075 | 258,028 | 206,122 | 208,385 | 142,517 | 61,248 | 131,084 |
| Tennessee | 10.0 | 156,336 | 142,174 | 115,230 | 106,361 | 89,519 | 64,010 | 98,535 |
| Missouri | −10.2 | 56,891 | 63,939 | 47,121 | 51,597 | 50,021 | 51,502 | 92,737 |
| Arkansas | 2.2 | 126,096 | 123,387 | 96,750 | 79,616 | 36,115 | 22,225 | 77,550 |
| Louisiana | 3.2 | 114,347 | 110,784 | 124,668 | 104,624 | 75,050 | 36,284 | 110,765 |
| Texas | 23.9 | 126,150 | 101,008 | 127,791 | 78,787 | 33,912 | 21,622 | 53,405 |
| Oklahoma | 8.4 | 5,418 | 5,000 | 4,000 | 3,600 | 2,500 | 2,000 | 4,000 |
| MID-WEST | 1.3 | 813,680 | 803,530 | 740,106 | 720,965 | 732,333 | 625,316 | 784,957 |
| Ohio | −5.4 | 304,480 | 321,960 | 321,287 | 303,120 | 310,885 | 255,000 | 300,000 |
| Indiana | 8.3 | 245,000 | 226,148 | 192,417 | 198,581 | 209,310 | 187,923 | 231,791 |
| Illinois | 2.6 | 25,227 | 24,582 | 17,527 | 16,719 | 13,707 | 12,000 | 15,000 |
| Kentucky | −1.6 | 91,500 | 93,000 | 85,000 | 90,000 | 85,000 | 62,000 | 90,000 |
| Michigan | .... | 109,327 | 109,327 | 94,575 | 83,645 | 86,281 | 83,405 | 112,616 |
| Wisconsin | 28.0 | 16,000 | 12,500 | 15,000 | 15,000 | 14,000 | 13,000 | 12,000 |
| Minnesota | 50.0 | 7,500 | 5,000 | 4,450 | 4,500 | 4,400 | 4,000 | 5,000 |
| Iowa | .... | 6,000 | 6,000 | 4,500 | 4,000 | 3,500 | 3,000 | 5,000 |
| Kansas | 87.2 | 7,746 | 4,138 | 4,500 | 4,600 | 4,500 | 4,303 | 12,650 |
| Nebraska | .... | 500 | 500 | 500 | 500 | 500 | 400 | 500 |
| South Dakota | .... | 150 | 150 | 150 | 150 | 150 | 100 | 200 |
| North Dakota | 11.1 | 250 | 225 | 200 | 150 | 125 | 125 | 200 |
| WEST | 10.6 | 120,545 | 108,963 | 87,704 | 92,699 | 92,314 | 87,749 | 84,810 |
| Montana | .... | 100 | 100 | 100 | 100 | 80 | 50 | 100 |
| Wyoming | .... | 100 | 100 | 100 | 100 | 80 | 50 | 100 |
| Idaho | 5.0 | 420 | 400 | 400 | 400 | 400 | 400 | 1,000 |
| Colorado | .... | 800 | 800 | 800 | 800 | 750 | 500 | 1,000 |
| Utah | .... | 500 | 500 | 500 | 400 | 400 | 400 | 600 |
| Nevada | .... | 30 | 30 | 30 | 30 | 30 | 20 | 30 |
| Arizona | .... | 500 | 500 | 500 | 450 | 325 | 300 | 500 |
| New Mexico | 25.0 | 750 | 600 | 500 | 450 | 430 | 400 | 700 |
| California | 9.2 | 93,845 | 85,933 | 66,274 | 71,519 | 74,519 | 72,629 | 66,350 |
| Oregon | 6.3 | 8,500 | 8,000 | 7,500 | 8,000 | 7,500 | 5,500 | 6,000 |
| Washington | 25.0 | 15,000 | 12,000 | 11,000 | 10,000 | 8,000 | 7,500 | 9,000 |
| UNITED STATES | 0.6 | 7,507,352 | 7,458,576 | 6,919,347 | 6,575,314 | 5,772,903 | 4,955,931 | 7,403,356 |

TABLE II—FERTILIZERS: FARM EXPENDITURES, BY STATES, CENSUS YEARS, 1879–1924
(1,000 dollars)

| State | 1879 | 1889 | 1899 | 1909 | 1919 | 1924 |
|---|---|---|---|---|---|---|
| Maine | 212 | 456 | 820 | 4,069 | 7,759 | 7,096 |
| New Hampshire | 165 | 246 | 368 | 513 | 526 | 441 |
| Vermont | 128 | 217 | 447 | 571 | 857 | 794 |
| Massachusetts | 653 | 897 | 1,321 | 1,966 | 3,907 | 3,336 |
| Rhode Island | 140 | 173 | 264 | 335 | 380 | 301 |
| Connecticut | 497 | 610 | 1,078 | 1,954 | 4,894 | 4,369 |
| New York | 2,716 | 3,628 | 4,493 | 7,142 | 15,067 | 11,607 |
| New Jersey | 1,602 | 1,838 | 2,165 | 4,278 | 10,743 | 8,597 |
| Pennsylvania | 3,525 | 3,384 | 4,686 | 6,802 | 15,628 | 11,189 |
| Ohio | 550 | 1,603 | 2,696 | 4,180 | 13,206 | 9,082 |
| Indiana | 341 | 778 | 1,554 | 2,190 | 8,735 | 5,712 |
| Illinois | 174 | 125 | 831 | 616 | 2,996 | 2,238 |
| Michigan | 301 | 173 | 492 | 945 | 4,873 | 3,971 |
| Wisconsin | 179 | 105 | 294 | 128 | 780 | 1,137 |
| Minnesota | 93 | 62 | 251 | 75 | 433 | 454 |
| Iowa | 99 | 87 | 337 | 110 | 597 | 538 |
| Missouri | 110 | 66 | 371 | 671 | 3,941 | 1,498 |
| North Dakota | .... | 9 | 14 | 10 | 120 | 76 |
| South Dakota | .... | 16 | 13 | 11 | 34 | 52 |
| Nebraska | 21 | 19 | 153 | 31 | 65 | 133 |
| Kansas | 62 | 26 | 268 | 76 | 979 | 342 |
| Delaware | 467 | 460 | 539 | 865 | 1,222 | 1,142 |
| Maryland | 2,838 | 2,420 | 2,619 | 3,388 | 7,610 | 5,126 |
| District of Columbia | 22 | 17 | 23 | 17 | 23 | 39 |
| Virginia | 2,137 | 2,320 | 3,682 | 6,932 | 17,278 | 13,083 |
| West Virginia | 176 | 211 | 405 | 529 | 1,710 | 1,049 |
| North Carolina | 2,112 | 2,882 | 4,479 | 12,262 | 48,797 | 32,002 |
| South Carolina | 2,660 | 3,868 | 4,494 | 15,162 | 52,547 | 24,306 |
| Georgia | 4,347 | 5,724 | 5,739 | 16,860 | 46,196 | 21,100 |
| Florida | 73 | 857 | 753 | 3,610 | 10,317 | 12,624 |
| Kentucky | 146 | 317 | 908 | 1,351 | 3,597 | 2,279 |
| Tennessee | 157 | 361 | 898 | 1,216 | 3,525 | 2,786 |
| Alabama | 1,201 | 2,422 | 2,599 | 7,651 | 14,066 | 14,564 |
| Mississippi | 123 | 789 | 932 | 2,703 | 4,288 | 6,262 |
| Arkansas | 56 | 94 | 173 | 597 | 2,573 | 2,995 |
| Louisiana | 278 | 906 | 1,077 | 2,005 | 3,840 | 4,140 |
| Oklahoma | .... | 4 | .... | 29 | 453 | 203 |
| Texas | 75 | 59 | 125 | 595 | 1,831 | 4,124 |
| Montana | .... | 5 | 4 | 12 | 126 | 6 |
| Idaho | .... | 2 | 17 | 21 | 106 | 59 |
| Wyoming | .... | 2 | 13 | 5 | 9 | 7 |
| Colorado | 5 | 25 | 23 | 61 | 294 | 127 |
| New Mexico | 11 | 9 | 3 | 25 | 113 | 88 |
| Arizona | .... | .... | 3 | 6 | 41 | 46 |
| Utah | 11 | 23 | 14 | 20 | 109 | 42 |
| Nevada | 3 | 2 | .... | 8 | 10 | 2 |
| Washington | .... | 12 | 29 | 87 | 526 | 535 |
| Oregon | 11 | 13 | 27 | 69 | 490 | 458 |
| California | 109 | 149 | 937 | 2,144 | 8,183 | 8,371 |
| United States | 28,586 | 38,470 | 53,431 | 114,883 | 326,400 | 230,528 |

sponding cost in 1913 is designated at 100. The range for phosphatic and potash fertilizers was from 100 to 122 in 1928 as compared with 100 in 1913. In other words, nitrogenous fertilizers are now much cheaper than they were in 1913, while phosphatic and potassic fertilizers are somewhat more expensive. Altogether, however, commercial fertilizers are relatively cheaper now than they were in 1913 when their value is measured in terms of crop values.

The consumption of commercial fertilizers in the United States has varied in recent years between 7 and 7½ million tons. Because of the increasing numbers of units of plant food in the average mixed fertilizer, the actual increase in the consumption of plant food is not definitely shown when fertilizer tonnages are compared. It may be noted, further, that a large proportion of the entire tonnage is consumed in the Cotton Belt. The accompanying table on page 263, taken from the *American Fertilizer Hand Book* for 1927, shows the distribution and use of commercial fertilizers in the different states of the Union.

The extent of the investments in fertilizers as indicated by the data in the table is shown by the statistics gathered by the Bureau of Agricultural Economics of the United States Department of Agriculture. The table on page 264 contains information on the expenditure on fertilizers by states during the period 1879–1924.

It will be noted that in some of the states investments in fertilizers are very large. Thus, in 1924, when economic conditions had become more or less normal, eight states spent more than 10 million dollars each on commercial fertilizers. Among them, North Carolina spent about 32 million dollars and South Carolina, more than 24 million dollars. The differences in the fertilizer investments per acre are reflected in the crop yields. Thus, in 1927 the average amount of fertilizer per acre used in the cotton states was 264 pounds, ranging from 125 pounds in Missouri to 420 pounds in North Carolina. Comparing the production in the more important cotton states, we find that Oklahoma, with an average application of 145 pounds of fertilizer per acre, had a yield of 138 pounds, whereas North Carolina, with an average application of fertilizer per acre of 420 pounds, had an average yield of 292 pounds of cotton per acre. Similar figures may be given for potatoes in different potato-growing sections, for tomatoes, sweet corn, asparagus, celery and other crops.

As population pressure increases, as land values rise, as the natural resources of plant food in our soils are diminished, the use of commercial fertilizers will increase. Improved methods of manufacturing, mining, transportation and distribution will help to maintain proper economic relations between the cost of fertilizers and the value of the crop increases obtained by their use. Indeed, there is reason to expect that, with the better understanding of the nature of soil fertility and the development of a greater degree of skill in the use of commercial fertilizers, the consumption of the latter will rapidly increase. Their use will be encouraged for economic reasons as well as for the relation that they may bear to the nutrition of animals.

# Farm Products in Industry

By George M. Rommel
Industrial Commissioner, The Industrial Commission of Savannah

THE use of farm products in industrial manufacture has been urged as a means of farm relief. As the idea has been developed in recent years, it has come to mean the utilization of the wastes in crop production, which comes down in the final analysis to the question of economic land utilization.

The farmer whose corn goes into various manufacturing processes, such as the making of starch and solvents, gets an outlet for low-grade grain which would be difficult to market through the usual channels. Even the cotton farmer gets some benefit from demands which call for low-grade cotton. However, it is to a considerable extent fallacious to argue that farmers should turn their attention from the production of food to the production of things which cannot be eaten. Food production always has been and in all probability always will be the main job for most farmers.

## Economic Utilization

Cotton farmers were producing entirely for the industrial market until the use of cottonseed for food purposes gave them another outlet for the crops produced and greatly widened the economic importance of the crop. As long as there was no other outlet for cotton than the manufacturing of textiles offered, the cotton farmer was surrounded with certain decided economic inhibitions. Even with the great food value now realized from cottonseed, the cotton farmer is little, if any, better off from an economic standpoint than the grain farmer. Until he is able to make a better utilization of the entire cotton plant than he now does, or is able to get better or more stable prices for lint and seed, the American farmer will be unable to produce cotton as cheaply as he should in order to meet competition.

We should approach this question as the meat packer did when he found that he could reduce his losses, add to his income, pay his overhead and enhance his chances of making money, by using everything which came to his hand, as far as he found that he could thereby make a profit. The elimination of waste, the utilization of by-products which are the inevitable accompaniment of most major operations in crop production, is the correct thing to be aimed at, rather than a wholesale change from the production of things edible to those which are inedible.

The alleged uneconomic utilization of trees has become almost a classic criticism of the timber industry. According to official estimates, of the tree as it stands in the woods before it is felled, only a little more than 30 per cent actually finds its way into finished lumber. When we compare this record with that made by the grain or cotton farmer, who, like the lumberman, does the best he can, the lumberman does not appear in such an unfavorable light. The corn farmer produces about 1½ pound of stover for every pound of grain which he husks out. The small-grain farmer gets at least 2 pounds and often 3 pounds of straw for every pound of grain harvested and threshed. In the case of the cotton farmer, the spread is still wider, for it appears from the figures available that, for each pound of seed cotton produced, there are from 2 to 5 pounds of stalks, leaves, bolls and burs. The grain and cotton

farmers who have livestock are able to salvage something of the vegetative parts of the plant, but if all this waste material were to be turned into the livestock channel, the market could not absorb the additional meat and milk which would be produced.

The increase in the prices of wood has brought these wastes forward, and straw in the Wheat Belt, cornstalks in the Corn Belt, perhaps cotton stalks, perhaps annuals grown for cellulose alone, must be reckoned with in the future as sources of raw materials formerly derived almost exclusively from trees. We then face the question of how to obtain these raw materials most cheaply and in the quickest time.

When we get this slant on the subject, our attitude towards forest production and farming undergoes a radical change. Much of America was settled by the clearing of the forests. After the trees, came farm lands and planted crops. Until recently we assumed that all that was necessary to make good farm land in a forested country was to cut the trees from the most level land and the farms would naturally follow. Now we are beginning to learn better, because the idea that the farm will always follow the logger has been tried and found wanting. We now know that there are millions of acres of land in this country that will make more money for their owners growing trees than in any other way, and that there are also millions of acres upon much of which the owners are trying to grow crops, where trees would be much more profitable. Col. W. B. Greeley, formerly chief of the United States Forest Service, has pointed out emphatically that our forest problem cannot be separated from our farm land problem and our grazing problem. The three are interlocked, and only as we view the problem in its entirety—land utilization as a whole—can we get the proper perspective. What lands can be best left in timber, what can best be farmed, what are most productive when used as grazing lands? What lands now farmed should be allowed to revert to timber? Still more to the point, in what ways can we get maximum utilization from the products of the soil once we decide upon the best uses to which it should be put?

With the entrance of crop wastes into the picture as sources of paper-base stock and structural materials, we are approaching the time when there will be a race between the annuals and the perennials as producers of raw cellulosic material—between the manufacturer and the wood-cutter, between the man who works with nature and grows things from the soil, and the man who leaves it all to nature and seeks his wealth in the accumulations of centuries of nature's bounty.

### UTILIZATION OF CROP WASTES

There are numerous examples of the successful utilization of crop wastes which are doubtless well known to readers of this article. Perhaps the best known is Celotex, an insulating board made out of sugar-cane bagasse. The production of this material has grown rapidly. Only a year ago the capacity of the factory at New Orleans was increased from 700,000 square feet to 1,200,000 square feet daily. Now the announcement is made that additions to the factory are under way which will bring the daily capacity to 1,500,000 feet daily—an increase of over 100 per cent in a little more than a year. This company owns extensive tracts around Lake Okeechobee in Florida, where it is planting sugar cane. Sugar mills are being built and in time Celotex will be manufactured in Florida as well as in Louisiana. In fact the president of the company was recently

quoted as saying that in time the company would be making a billion feet of Celotex a day in Florida.

The Celotex development has had a marked effect on the sugar cane industry in this country. Until the manufacture of bagasse began, this crop waste was used only as fuel, and indifferent fuel at that. The contracts which the company makes with sugar planters are based on the oil-replacement value of the bagasse. It is even said that, after turning to oil, some planters have found that their steam costs are actually lower than they were when bagasse was used as fuel. Be that as it may, the fact that it is bagasse which the Celotex Company needs in its business, and not sugar, makes this development of especial economic importance, because bagasse becomes the main crop and sugar the by-product. So, when it was found that the fibrous, disease-resistant P. O. J. canes made it possible to grow sugar cane in Louisiana in spite of the mosaic disease which was threatening the existence of the sugar industry in Louisiana, the Celotex Company naturally got behind the effort to supplant the old varieties with those which would resist mosaic, knowing that the P. O. J. varieties would produce not only more sugar, but more fiber. What effect this development will have on farm practice in the sugar districts of Louisiana will be disclosed as time passes. The Celotex Company has gone into the plantation business, and the efficiency of its manufacturing methods will be extended into its plantation management, from which they should be reflected in the management methods on other plantations.

Straw has been used as a source of paper-making material for many years, but recently it has been used mainly for boards, and even in this field it has not been holding its own. First waste paper and now kraft chips have taken the place of straw as raw material in many board mills. The "straw belt" has slowly moved westward as farmers increase their utilization of straw for feed and bedding. At the same time, straw continues to be burned all over the Wheat Belt. This waste has found some utilization in the manufacture of insulating board at St. Joseph, Missouri, and a good market is being established.

In the case of cornstalks, the feed and fertility value is found mainly in the leaves and husks. Take these off and the remainder has little value to the farmer for any purpose. In volume, the importance of sugar-cane bagasse cannot compare with that of cornstalks. The writer has estimated that, in the two states of Illinois and Iowa alone, the *unused* parts of the corn plant, which are burned or plowed under every year, amount to over 8,000,000 bone-dry tons, enough to make 42 times as much insulating board as the Celotex Company manufactures in a year. In nine Corn Belt states, the unused cornstalks, after allowing for the weights of leaves and husks and for moisture content, total an average of 33,000,000 tons a year. Assuming a yield of 33⅓ per cent, this would be enough to supply the annual needs of the United States for paper.

### COLLECTION PROBLEM

Celotex became a commercial product as a result of thorough economic and chemical research. The company which has done most to put the cornstalk in the ranks of industrial raw materials has already spent money in research which runs well into six figures, and has now reached the point where its pulp is going into paper manufacture, while its by-products are said to be on the market also.

The strength of the position of crop

by-products as raw material for manufacturing is that they are by-products and not main products as wood is, and that they are produced near consuming centers. Their weakness lies in the fact that it is expensive to collect them. It is often said that the Celotex Company does not have a collection problem. Strictly speaking, this is true. During the grinding season, bagasse accumulates in great piles around the sugar mills, but it must be baled and treated to prevent spoilage in the stack. Cornstalks present no storage problem so far as deterioriation in the stack is concerned, but they are expensive to get together; they must be collected before they are accessible to the baler. It does not appear that there is a great difference in the cost of raw material whether one is using bagasse or cornstalks.

Depending on the successful handling of the collection problem as it does, the utilization of cornstalks in manufacturing also means in the end a higher type of farm management. The first year's work of the Cornstalk Products Company disclosed some remarkably favorable results, with costs per ton delivered in one case slightly under $6. In the second year's work, some surprising things were learned about the economy of methods of harvesting which have been regarded as obsolete. This leads to the opinion that perhaps our agricultural machinery engineers still have some distance to go in working out really economical and efficient corn-harvesting methods. With the coming of the corn borer, it will be necessary to consider this problem not only from the standpoint of manufacturing but also from that of farm management, and the two phases should be linked together. Here, again, the driving force of efficient, low-cost management will probably make itself felt.

### MANUFACTURING PROGRESS

Meanwhile, much progress is being made in manufacturing processes based on and allied with the timber industry. An insulating board made of sprucewood is said to have preceded Celotex on the market and that product is one of the principal competitors of Celotex. The paper manufacturers are beginning to recover by-products, so that, some day, instead of lignin being a wasted product, it will have value.

In the Masonite process in Mississippi, sawmill waste is exploded in steam digesters, refined, sized, run through presses and comes out as synthetic lumber which is flawless and grainless—more nearly perfect than any lumber which can be cut from trees. Bark and all go into this material, and if it paid to do so, the entire tree could be utilized, leaving nothing in the woods except the stumps and leaves. Even saplings and twigs could be used if they could be collected economically. If it were possible economically to extend the Masonite process generally throughout that section of the country, using the available sawmill and timber wastes, the lumber output of the South could be doubled overnight.

Lumber will never again be used in the United States as it was used 30 years ago, but trees will be put through some sort of manufacturing process so that a greater utilization of the tree may be made than is possible with conventional sawmill methods. It is an interesting fact that the men who are manufacturers of timber products are not discouraged as to the future. In no section is this more striking than in the South, where every paper mill which owns timber is carefully conserving its woodlands and protecting them from fire. Without exception, the southern paper mills are buying large quantities

of their pulpwood supplies, and the largest of them all, with 300,000 acres of land and an annual consumption of 300,000 cords of wood, is not cutting a stick from its own woods, but is buying its supplies from farmers and small landowners. Timber land is being held as an investment by these companies against the time when sustained yields may be realized from them, not only for pulpwood, but for lumber also.

With such a wealth of raw manufacturing material, with the wastes from our crop farms, our sawmills and our forests being brought more and more under the influence of the genius of the chemist and the engineer, the problem of our virgin timber supplies loses much of its importance.

# Farm Relief and a Permanent Agriculture

By R. G. Tugwell, Ph.D.

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THERE are immense areas of uncertainty with which anyone must deal who concerns himself with the likely future of such an activity as farming in such a region as the United States. These areas may, however, be to a certain extent reduced by bringing to bear the generally available experience of other regions which are in stages beyond that which we have reached. It is not necessarily true that evolution here will be identical with that of other regions; but there is some presupposition in favor of it. And since we seem driven to speculate about a desirable program for relief we ought not always to evade the fact that commitment to any program will also be a commitment to one kind of a future rather than another.

The technique of farming is like any of the other industrial arts in this: that it comes to be taken for granted without fundamental examination. And those who are engaged in it, when they ask to have their hands upheld, are as apt as others to resent any and all criticisms of current practice. They want their occupation made profitable as it is; they do not want it changed. And because any group which is determined can, under our legislative system, make itself politically formidable, there is not likely to be much exploration of causes or of more desirable modes of operation. But these cannot long be hid, especially if some costs to others in the community are involved—as they are in farm relief. And a backward agriculture is no more likely to succeed in the long run than those industries were which attempted to turn back the rising tides of the efficiency movement. When ideas are the enlargement of facts they seem to have a will of their own to succeed. And agriculturalists who repel them will find themselves in the same ultimate dilemmas in which old-fashioned industrialists have squirmed during the past few decades. State help which only fell short of outright subsidy could not bring relief to inefficient manufacturers; it could not even prevent whole backward industries from falling into desuetude. It will be no more successful in this other industry of agriculture.

## Stages in Agriculture

It must be granted that farming has suffered many and grave disadvantages and even that there have been discriminations which operated to make it unprofitable. These ought by all means to be corrected. Yet it does not follow that the industry ought to be supported indiscriminately. There is at least a presumption of technical weaknesses which ought not to be encouraged; and, taken as a whole, it cannot be said to be entirely suited either to our soils and climates or to the needs of our people.

Some light on these problems can be had by taking a general look at the evolution of farming as a national art. If, for the sake of illustration, we take in at a glance the advanced, the middle, and the backward agricultural regions of the world, we see that there is first a stage when crops are grown spasmodically on land which is then abandoned again to nature for an indefinite period. In such times and places not much pains is taken with cultivation and there is no attempt at the maintenance

of fertility. It is in no absolute sense a primary stage of agriculture, but it is a first stage of cultivation. Whether or not tools and machines are used, it is something which is primitive and transient. A good deal of our West is, speaking in a technical, land-use sense, no more advanced in the art than many regions of the world were hundreds of years ago. Much of Manchuria, most of Siberia, and vast areas of South America have not progressed further than this.

A next stage might be distinguished as one of settled crop growing joined to animal husbandry. Rotation is practised, fertility is guarded, cultivation comes to be studied. Typical crops are the cereals, the roots and the grasses. The main distinction of this stage as over against the preceding one is the feeding of cultivated grasses, roots and cereals to animals on a large scale and the use of animals and animal products as sources of cash income. Most of the Eastern United States is in this stage. So is European Russia (though with a difficult and backward land organization which is rapidly being changed) and a good deal of Eastern Europe.

The further stage to be seen most prominently in Western Europe, but also in some limited regions of the United States such as Eastern Pennsylvania, the Puget Sound country, and the farming region which centers in Ohio, is an intensification of this trend. Cereals are reduced in acreage, as are also roots, and the area thus freed is devoted to legumes, technical crops and grasses. A far greater proportion of income is received from animal products; indeed a point is reached when nothing can afford to be grown but animals, along with some technical crops and fruits, for cash purposes. The whole of the farming operation comes to center in husbandry—largely of cows and swine, with poultry and sheep as secondary resources.

These developments can be seen to be happening. It is interesting from our point of view to note that the United States exhibits every stage, from primitive to most advanced. In view of this lack of homogeneity, more of a problem with us than with almost any other nation, difficulty might, at the outset, be expected in the attempt to frame any program which would meet all the needs or satisfy all the demands. And in reality the relief measures of the last few years might well have become law if at any time it could have been shown that all the farmers were agreed on a plan. There was much dissention; and there was consequent weakness at critical times. There is no such difficulty in such countries as France, Germany, England, or Denmark. France and Germany, for instance, exhibit a wide variety of soils, climates and cultures, but the technique is far advanced and, except for special conditions in high altitudes and in regions devoted to market-gardening, answer to the tests of intensive animal culture, reduction of cereal crops and increase of fodders. These would have gone further, also, if wheat, particularly, and some other crops, had not been carefully protected from external competition. Those who are studying such matters in these countries see well enough the logical end of present developments. What they are wondering is what comes after. For, in spite of advanced cultivation, and continued Government aid, agriculture in most of the countries of Western Europe (Denmark alone excepted) is economically depressed and a continual source of worry. We have our own depression; but we have yet to enter the stage which precedes this uncertain something new. In Europe they are won-

dering whether their farmers all will soon be gardeners; or whether larger estates, more impersonal and expert management, and greener fields will not emerge — or, perhaps, as seems likely, both. At any rate, this most advanced region is also on the threshold of reorganization. But we move still toward the cereal-reduction and grass-increase stage. A recognition of this immediate trend (in our most important farming regions) is, for the moment, more important to us than speculation concerning a more removed future.

### SOME CHANGES

It is interesting to speculate, however, on the differences our current practice would show if we had attained the stage of development toward which we seem to be moving. First of all, there would be less cultivation. Crops which called for extensive baring of the soil would be greatly reduced. It will be said that cereals require this; and that cereals are necessary for feeding animals; they cannot, therefore, be eliminated even though none of them were used directly for human consumption. It is true that cereals must be grown somewhere in the world so long as our present dietary for animals and for people remains unchanged. It is significant, however, that the great cereal areas have usually been also the backward regions. The more advanced a nation is in agriculture, the less its good lands are devoted to wheat—unless there is artificial support, as in France at present. The prominent exception to this is the Corn Belt of the United States, where our choicest lands are seeded to corn. But this can be explained, if one wishes, by a double accident of time and geography. Our corn lands happen to lie between the ranges of the West and the market centers of the East; the soil happens also to be deep and new. It seems inevitable that as time passes and the elements of human geography change, a revolution will have to occur in the Corn Belt.

At any rate, this exception does not seem to disturb the rule that cereals find difficulty in surviving under advanced conditions. The vast plains of Siberia, and of South America and Africa, will, probably, during the next century, be the great sources of wheat. The United States will turn to the many superior types of grasses and legumes which are already available but so far not very extensively grown —particularly the modern varieties of one very old plant, lucerne, which we call alfalfa. The rôle of alfalfa in the future of American farming may easily be far more important even than corn is at present. It is true that the soil has to be exposed for planting purposes, but only once in several years, depending on the soil and climate, and constant stirring is not a feature of its care.

Efficiency in handling has been very difficult to develop with corn; it promises to be less so for alfalfa. Once the attention it deserves is centered on this crop by mechanicians and chemists the remaining problems will be solved with ease. When we know how to dry and transform it quickly into a concentrated and transportable commodity on a large scale it will quickly come into its own as a practical and universal commercial crop. But the greatest benefit which would come from its substitution for corn and wheat would be a social one—the prevention of erosion. For this it is incomparable.

It is seldom that one generation suffers the full penalty for soil washing; the top-soil vanishes too slowly to make its conservation a constant and immediate care in cultivation. It becomes, therefore, one of those social

problems which are so very difficult to solve under our prevailing system of individual enterprise. Yet there is no single danger confronting the United States to be compared with it in ultimate consequence if immediate steps are not taken to assist in its preservation. And it will easily be seen that the more rapidly we move toward permanently covered land the more relief we can feel. If some practical and profitable system of culture offers itself which will gain this benefit for us we can feel fortunate. It seems a lucky circumstance, indeed, that the trend of agriculture, motivated by other forces, seems to hold out this hope also.

It is not only our prevailing hilly contours which has made soil losses greater for us than on the flatter and heavier lands of Western Europe. The character of our rainfall is also different; it comes in deluges. And, as anyone can observe who travels through the countryside, we have been extremely backward about putting into practice contour cultivation. Our orchard practice has been likewise more intent on immediate returns than on conservation. In consequence orchards are almost universally cultivated, the land being bared throughout the whole year. Tree crops are certainly a distinguishing feature of a permanent agriculture; but of a sort we have not yet developed. Fixed orchard lands are less frequent in older countries. Trees will grow where other crops will not; and this is where they should grow. But also we might gain immensely by adopting what Professor J. R. Smith has been calling for years "two-story agriculture," meaning simply that other small crops will grow under producing trees without loss to either. This applies to nut as well as to fruit crops. Our method of fixed orcharding with continuous cultivation will certainly need revision. Another great source of waste has been the useless destruction of forests and wood lots. Much of the land our ambitious ancestors cleared might better have remained forested. This applies particularly to steep slopes and to poor soils. We have now much reforesting to do even in places where forests are not usually thought of as characteristic of the country.

This sums up a few of the changes which seem likely to occur, both because they have happened in more advanced systems and because common sense indicates that we should be better off if they occurred. But there are still others. Machine technique must not be overlooked. We have passed the time when any system of land use will have a chance to develop which calls for more rather than less handwork. And agriculture will have to be made more amenable than it has been in the past to the substitution of machines and power for men. But here again, as in the case of the prevention of soil losses, alfalfa and similar crops seem to possess great advantages. The preparation and seeding of land and the harvesting of grasses can be reduced to much simpler elements than can the similar cultivation of any crop, except, perhaps, wheat, on lands where combines can be operated. But for really practical operations it is necessary that drying and chopping be done almost in one operation with the harvest. We have the beginnings of such machinery. It may be expected to develop and to spread very rapidly.

But there is another condition which must be met. It has often been remarked that no other business could carry the terrific burdens of overhead cost per unit of product which are characteristic of farming. Barns with much of the space wasted for a good part of the year, machines used on a

few acres and for a total of eight or ten days in the year, many of them are quite usual. Because farm operations are small and because cost accounts are infrequently kept, the real size of this burden is not appreciated. Great gains could be made in reducing these costs, as well as in making a manager's brains and effort spread itself over more units of product, if the size of our farming operations should be greatly increased. There must be some revision of the size of holdings; but also, the confining of field operations to more favorable terrains must take place.

There are comparatively few farms in our typical mixed-farming region where more than half the acreage ought to be devoted to field crops, especially with several generations of soil washing having passed. Just how this necessary reorganization can be brought about without some exterior control or direction it is difficult to see. What might be profitable from the individual point of view—or, at least, what each farmer might think he had to do, which is to get as big a profit out of his one, two, or even twenty-year tenancy as he can—might not be at all the thing which would seem advisable socially. Yet somehow we seem forced to make revisions in these respects. The operating units of the future must be larger than those of the present, and much of the land now in use—east of the Mississippi, at least—must be abandoned so far as field crops are concerned. It ought to be devoted immediately to forests again, partly because we shall need tree products in the future, partly because it helps to prevent soils in the immediate neighborhood from washing, but partly, also, because immense and widespread floods have become a problem in themselves, and one, evidently, of National importance. This is the only way they can be controlled, permanently.

It is often said that economic forces will bring about these results—that whatever crop is most profitable will be grown, and that the most desirable practice will, because it is most advantageous, be adopted sooner or later. There are reasons why, in agriculture, this simply is not a true description. The social interest frequently, as we have seen, runs contrary to that of individual operators. Or, it may be that the time element defeats good results which otherwise might take place. Practices which might be socially desirable as well as profitable to the farmer are prevented from adoption simply because pressures on him are too great to allow of conforming to long-run trends. A farmer who looks forward to a few years of tenancy, or to selling his holdings in the near future, will not be led, by his expectation of profits, to plant trees which require forty years to mature, nor to prevent erosion, which takes a generation to ruin his fields. Nor has farming in itself ever been a sufficiently profitable occupation to tempt capital and enterprise on a large scale. A dozen miserable farms, which pay their operators poor returns, might be made, if they were combined and expertly managed, to yield a good return. But not unless a whole generation, perhaps, were the period to be allowed for the experiment. And this is not attractive to private enterprise as we know it in America. The question is whether the results, in the conservation of resources and in the rehabilitation of our declining rural life, are sufficiently important and sufficiently certain to justify governmental interference. No one can be prepared to say offhand, though it is easy to criticise quite justly our present methods. The really disturbing thing is that this whole range of considerations never enters any discussion of proposals for relief. The changes referred to may

take place within a hundred years if there is no interference. But there seems no escaping the fact that by then we shall be immensely poorer in many ways than we should have been if we had moved in some fashion to construct and pursue a well-defined, even if a flexible, policy. There seems, it must be admitted, little chance of any such activity, but there is no good reason—except a human one—why it might not happen.

## THE FUTURE

The probabilities for the new agriculture are, then, that there will be more legumes and grasses, and a reduced cereal culture, particularly less corn; it will have more animals in larger groups; it will have more trees, especially of the food-bearing sorts; it will be carried on in larger units, but on less land and with a smaller personnel; it will be more highly capitalized; there will be fewer proprietors and more workers. If all this can, for the moment, be admitted, there are a few subsidiary generalizations of some interest. One of these is that the American farmstead system, which sets our agriculture off rather sharply from that of Europe, and which has been vigorously defended as making for self-reliance and efficiency, may turn out to be a handicap. We may have something which will, superficially at least, look like the peasant village of Europe, a center of agricultural and subsidiary manufacturing operations, with homes for workers and for resident pathologists, veterinarians and managers. The fields about are likely to be wide and unfenced, since animals are likely to be confined for the most part, and since freedom of movement will be a serious consideration for the immense machine-units which will come into use as the scale of operations increases.

All this, if interesting, is a highly general and speculative picture. The new agriculture will not develop to fit any fixed and rigid delimitations such as may be suggested here, but will create its own forms and social conditions. There is no harm in projecting the conclusion of present trends or the results of desirable developments, but it is more important to ask immediate questions. Some of these will occur to the reader at once. Is the cereal content of our diet likely to decrease? We had been thinking of cereals as a very beneficial substitute for meat. What will become of the cotton and tobacco crops, not to mention such others as the cultivated roots, including the potato and the sugar beet? And what is to happen to the usual American rotation which includes, besides a legume, wheat and corn?

There is no doubt that there would be immense resistance to any reduction in the cereal supply for human food. Yet we may get that supply from other and newer regions of the world. They will certainly be cereal producers for a very long time to come. It is just as well to keep in mind the briefness of the period, historically considered, during which cultivated cereals have been a major dietary dependence for Western Europe and America. We could, if we had to, get along without them again, though, so far as we can see now, it would be difficult. Something will have to be done, in time, for a hundred or two years is a long time for land to have stood up under cereal cropping.

Corn, of course, is the worst of the lot as a soil waster; winter wheat is perhaps the best. It is significant that Western Europe has never tried to grow corn extensively in spite of its great advantage over wheat in yield per acre. We usually assume that the reason for this is a climatic difference. But this is not the whole explanation. The hot midsummer nights of the Corn Belt are

advantageous; but corn can be grown in Europe and can be made to average at least twice the yield of the best wheat. The real reason for its failure of wide adoption there is rather the expense of its cultivation. In this Europe has been fortunate; it has saved inches of precious topsoil which could not well have been spared. And we in America are fatuous, indeed, if we suppose that the cost of our nearly three billion bushel crops year after year has ever been registered in statistics. But corn is only just worse than wheat in this respect, and probably not so bad as cotton or tobacco, raised on the light soils of the South, and in markedly hilly country. What about these? One hesitates to suggest that we may have to consider seriously a reduction of the acreage given over to such economically necessary crops; it may, nevertheless, turn out to be so; and we could start by saving the hillsides and confining the most intensive cultures to lands which are as flat as possible.

It may seem strange to insist on these considerations; it would probably seem strange to talk of restriction at any time before 1950. After that we shall be in a position where we cannot escape—from sheer necessity. We do not often enough stop to think that modern agriculture is scarcely a century old in most parts of the world—even in Western Europe and the British Isles. We do not know how long soils will survive their prevailing uses. Well used, tended and restored, there is every reason to believe they will last as long as mankind; but we have cut off the forests; and for months of every year we expose a large part of the land to the elements. It is not use we have to fear, but abuse. In this, America is the world's worst offender; we have scarcely had time to be made sorry as yet. But the time cannot be far off.

It is perhaps not irrelevant to refer again to *laissez-faire*. For modern agriculture was and is organized according to the scheme of freedom of enterprise individually directed and independent of supervision from any authority higher than its owner. The exploitation of the land has gone on in this way so far without unbearable social penalties. But the applicability of the idea to agriculture has its obvious drawbacks from the social point of view. It seems strange that this industry, in which the social interest is so strong, should be so dedicated to individualism as to preclude any watching over its custody of our resources. There is no denying the backwardness of agriculture; there is no doubt that we know ways to improve it; there is no question that immense wastes take place which it is hard for the community to view indifferently. Yet an idea, a doctrine, stands quite solidly in the way—never more solidly than at present.

### SOME EXAMPLES

We shall not, in our generation, be witness to great changes. The forces which affect agriculture do not come in revolutionary ways; they are measurable in decades rather than years. And it is when we regard the changes which may happen in half or three-quarters of a century that problems become clearest. For the sake of illustration, the reader's attention might, for instance, be invited to the history of Virginia or of Massachusetts. The rôle of Virginia in our history has been distinguished. Her richness was, for at least a century, traditional. Her fields helped to support the Revolution; and her Great Valley, so late as the Civil War was called the "granary of the Confederacy," and as such was a focal point in military strategy. Her eastern counties are spread with manor houses, mostly fallen now into significant

ruins. One who forms a notion of what Virginia soil must be, by reading the records of her past, ought never to visit her now without some preparation for disillusion. And where has her richness gone? Down the furrows of her fields into her creeks and rivers and so to the sea. And the same is true of Massachusetts—and of most of the rest of the Eastern Seaboard where sloping land prevails. It has not yet happened in Ohio, Indiana, Wisconsin, Iowa; rather, it has not gone so far. But there is nothing to prevent such devastation there as well. The soils of the Mississippi Valley are deeper, the contours, for the most part, not so rolling. Yet fifty years more of corn and wheat will do for Illinois and Kansas just what was done by similar cropping to the farm lands of the Eastern Appalachian slopes.

It has already been said that the kind of farming in Western Europe shows fairly clearly the evolution of the art; and that its chief characteristic is that it tends to become greener, to include fewer acres of cereals and other highly cultivated crops.

It may be asked why such an evolution has not occurred in New England or New York, whose farms are, in most senses, quite as old. The answer to this is that there has been some change; but that the continual competition of new and unwasted lands has prevented its going forward so rapidly as in Europe. It is not, I think, in the Middle West that the most advanced farming is done; but in Eastern Pennsylvania and the better valleys of New York and even Massachusetts. This, however, has been a progress achieved under difficulties. For Eastern farmers whose lands began to show signs of exhaustion during the nineteenth century always had the alternative of going West. It was characteristic of several generations to migrate toward virgin lands where the customary farming could again be made to pay. But there are no more such areas. And in the next half century we may look forward to such a change as has happened in Europe. It is surely fair to ask whether we ought to support, by Federal aid, a kind of agriculture which will ruin the last good land we have. There is some significance, perhaps, in the fact that the support for the McNary-Haugen measures came from this West whose type of agriculture is least advanced, even though it might be shown to be most profitable.

It would be a mistake to conclude that rural statesmanship in Europe has been wiser than ours. In general, outside of Denmark and Germany, it probably has not. France has, for instance, persisted in using every possible means to prevent the decline of wheat acreages; and England is giving bounties to growers of sugar beets. Both these are, from a general—rather than a narrowly nationalistic—point of view, mistakes. France probably raises twice as much wheat as she ought; that is to say, her land might more profitably be used in other ways. The same is true of England and her sugar beets. These things are well enough known; but politico-military reasons are judged more important than low prices or land conservation. The hardships which the European population bears in this cause are not easily justified by any reflective tests. But they are even less justifiable in the United States. We are, in fact, because of our wide area and our variety of soils and climates, in a better position than any other nation (excepting Russia) to view the probably and desirable futures, to set them off against each other, and to enter on a program of conservation and wise cultivation for which posterity, in not the present

generation of farmers, would have cause to thank us—better, that is, in every sense except that of the willingness to do so; by tariff protection and otherwise we seem to be about to repeat not only the evolution in technique of Europe, but her political mistakes as well.

## SOLUTIONS

It has not been intended, in what has just been said, to imply that we ought, forwith, to attempt the drastic restriction of cultivation, nor to revise our practice in any other definite way. These things are matters for long consideration and careful counsel. I have simply wanted to point out that there is a whole range of problems which are being overlooked even when we seem about to adopt policies which will certainly affect their solution in one way or the other. And it is not necessarily unwise, even without further documentation, to ask consideration for the certain decimation of our soils and the continuance of farming practices which may soon, if they are not already, be obsolete. The easiest specific measures we could take, and which seem quite certainly desirable, would be to arrange for lessening the cultivation of our hillsides, for covering our exposed orchard soils, for encouraging the growth and multiplied use of alfalfas, for increasing and intensifying our animal husbandry, and for the planting of millions on millions of trees wherever cropping has wasted the soil or wherever forests have been cut from lands obviously suited only to the culture of trees.

In view of the seeming desirability of these developments, there may, just briefly and in their light, be considered the proposals most prominently made for the relief of the present agricultural distresses. Of these the various measures known as the McNary-Haugen Bills—and especially the last of these, that of 1928—deserve most attention because of the narrow margin by which they missed becoming effective laws. There is no need here for an extensive analysis of their provisions. For our purpose it is sufficient to note that they were intended to make certain specified kinds of farming profitable, not by actually controlling the surpluses which were thought to bring them into unfair competition with European crops, but by dumping these surpluses abroad while the domestic prices were held firm through the tariff mechanisms which might prevent the entry to our markets of similar commodities from other countries.

The American consumer would pay, admittedly, a higher price; but this could be justified by reference to the costs of farming which are certainly made abnormally high by the protective duties imposed on goods he has to buy. It is difficult to find any fault in this logic, given a general protective system, except that unless surpluses were controlled they might grow so large as to swamp any thinkable administrative scheme. Opposition to the measures was not based on the notion that they did not go far enough in the direction of control, though this would have been possible to argue. It rather came from a different source: a doctrinaire unwillingness to depart from laissez faire.

The bills would undoubtedly make a breach in our careful attitudes of individualism; but those who framed the bills could see no way out of their dilemma, except to sugar-coat the pill by calling price-maintenance profit-insurance, and by similar other devices. Vigilant and militant opponents saw through the scheme easily enough, but even in the successive revisions which sought mainly to alleviate this fear, they were unable to escape the necessity of much governmental activity if

an industry so individual and independent was to be welded into a machine with national purposes. In reality all this machinery—including the much-discussed equalization fee—was only a nominal departure from *laissez faire*. No real governmental interference, in the sense of dictating to individuals, or of carrying on any part of the industry by the Government, was contemplated. Various units of the industry were to be empowered and aided to combine for exploitation of their markets after the approved fashion of other more forward industries. But farming was not to be changed; and no prerogatives were to be interfered with—except possibly those of consumers. But no one is very solicitous about purely fanciful rights the consumers may be said to have to low prices. The opposition was adamant, and strategically so placed that the bills could be prevented from becoming law.

Just such literal interpretations of doctrine, and hysterical fears of allowing the camel's nose to get under the tent, have served before to bring doctrines into disrepute. Free enterprise as a useful system will be more questioned because of such support than it might be if it were interpreted more flexibly. This seems to be one of those instances in which, as Professor Patten used to say, what is essential might be preserved by sacrificing what seems important. In reality, as has been implied, the severest logical strictures would come from an entirely different source: those who feel that not enough interference was contemplated, that *laissez faire*, was, in spite of everything, really to be saved. There are actually those who do not want it saved. Persons who feel this way would say that the McNary-Haugen scheme represented an uncritical approval of an agriculture which is wasteful and backward and which continues to sacrifice social ends for meretricious individual ones. Agriculture, if necessary at the public expense, was to be made profitable; and this was to be done uncritically and with no attempt to guage the future or to penalize inefficiency or anti-social techniques.

It is, of course, arguable that some such support is necessary as a preliminary to anything further. Certainly those industries which have been most profitable are the ones which now exhibit the best technique, the greatest devotion to efficiency, and consequently the lowest costs. And this may be largely because the surpluses at their disposal are so readily turned into capital expenditure. They easily become the sources of rebuilding, of better planning, of new machine equipment, of better management.

Perhaps the first step necessary in agriculture is to make it likewise profitable. On the other hand, it might be urged that even the most profitable and efficient of modern industries have surpluses, or, what amounts almost to the same thing, the equipment which, if operated to capacity, would produce them. This is a burden of overhead costs which must somehow be carried.

This seems, however, only to point to the necessity for more interference, for more planning and control at least, in other industries, not for less of it in agriculture. There are those who feel that it is more necessary to plan, to arrange for advance in agriculture, than in any other activity, just because it is agriculture; because the enterprisers engaged in it are the basic producers—if the word can be allowed—of our system; and because they are entrusted with the most precious and perishable resource we have—tillable soil. Also, perhaps, because, being a huge activity, however it may be measured, its present backwardness is not only a disgrace

to those actively engaged in it, but a gross reflection on American ability and a significant drag on the whole economic system.

But other aids are being given and still others are suggested; do any of them offer anything in the way of advance? There is much to be said about credits; we have done something —in 1916 and in 1923—there; but not enough, for personal credit is still at the normally unfriendly disposal of the country banker. Credits, in any case, we do not conceive as selective in the sense of encouraging any socially superior type of culture. I deliberately avoid discussion of the three other great comparative disadvantages which agriculture labors under—disproportionate tax burdens, an incorrect railway rate structure, and a tariff system which, in its very nature, is costly to farmers as consumers and producers, and cannot possibly, except in minor instances, affect their selling prices. None of them, though they are important in a comprehensive relief program, bears on the problem here being discussed. Nor, so far as I can see, would the proposal to support by Federal aid the infantile coöperative movement, have any great effect.

If there were any real chance of great coöperative growth in the United States, the attempt at reconstruction through it would be worth its cost. But the very success of coöperation in certain instances seems to offer the most damaging prognosis as to its success in other cases. Consider any of the great staple crops—wheat, for instance. There are few states, with the exception of a few Southern ones, in which wheat is not grown. Its importance varies, it is true. But even in those regions in which it is of least importance, enough is grown to make it necessary to include them lest marketing control should be upset. This sets as a first condition an almost nation-wide organization. On the whole it seems extremely doubtful whether integration to the point of planting and market control is possible through any other agency than the Federal Government.

This leads directly to saying that if coöperation seems an unlikely practical instrument for planting and market control, and if the Federal Government offers the only alternative, then Government control is what ought to be examined first quite dispassionately and without preconception to see whether the necessary things can actually be accomplished through it. Still there seems hardly any doubt that the strongest dissenters to such a suggestion would be the farmers themselves—a point which was made at the beginning of this paper. They, as good individualists, and believers in freedom of enterprise, would hold that they have rights, vested rights, with which even public authority ought not to interfere. Among these may be the right to run furrows up and down a hill, thus facilitating as much as possible the flight of the soil to the sea or in other ways to exhaust fertility; and certainly the right to grow corn or cotton in any amount in the face of probably disastrous returns.

There are few public authorities in the world who dare set up and enforce expert opinion in opposition to rule-of-thumb practices and anti-social acts; and, needless to say, the United States is not one of them. It may be set down, in fact, as the most reluctant of all. It is, however, true that our greatest solicitude has characteristically been for the rights of individuals and enterprises outside of agriculture; we might interfere there perhaps more readily than elsewhere. Then, too, the farmers are forever at the doors of Congress asking for relief. This conjuncture of attitudes may just possible give the expert

his chance. We may offer the farmer assistance on condition of good behavior—the good behavior consisting in growing those crops which seem wise in such amounts as seem desirable, and by such methods as social prudence dictates.

If, in the decades to come, the situation should develop in this way, the single great contribution we are prepared to make to agricultural advance may have an oppportunity to register. For many years, scientific work has been going on. New crops and better varieties of old ones, ways of treating and preventing diseases, ideas of proportionality among cultures have been developed. It is our luck to have made the greatest expenditures and attained the greatest successes in these activities; they may well turn out, in the end, to be the most useful aid we shall give our agriculture.

# The Mississippi Waterway

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THE unfavorable economic condition of Mid-West agriculture is due to many causes, especially those arising from the World War; however, transportation has produced, unquestionably, a very marked effect upon the situation. The Department of Agriculture has estimated that the increase of railroad rates on agricultural products since the War has averaged 57 per cent. On shipments of wheat for export, the following are typical cases of increases in rail rates, in cents per 100 pounds, from 1914 to 1926:

Winter Wheat Area

| | *Cents* |
|---|---|
| Chicago, Ill. | 7⅛ |
| Cincinnati, O. | 8½ |
| St. Louis, Mo. | 13 |
| Kansas City, Mo. | 11½ |
| Beatrice, Neb. | 17 |
| Omaha, Neb. | 15 |
| Wray, Colo. | 18 |
| Brewster, Kans. | 17½ |
| Great Bend, Kans. | 17½ |
| Wichita, Kans. | 17½ |
| Cherokee, Okla. | 18½ |
| Oklahoma City, Okla. | 19 |

Spring Wheat Area

| | *Cents* |
|---|---|
| Duluth, Minn. | 7⅛ |
| Groton, So. Dak. | 15⅛ |
| Larimore, No. Dak. | 13 |
| Makoti, No. Dak. | 16 |
| Scobey, Mont. | 19 |

In a general way, it may be stated that railroad rates, since the War, have increased from 6½ cents to 12 cents per bushel on export grain. On the other hand, our principal agricultural competition lies in Argentina, Australia and India. Foreign farmers produce close to ocean ports and pay but little, if any, more than pre-war rates, because shipping tariffs are substantially at pre-war levels. Furthermore, while it is true that the discussion of rates applies, generally, to exports of grain, nevertheless the price which the farmer receives in foreign markets is the principal factor in determining his return upon the part of the crop sold in domestic markets.

Coincident with the increase of rail rates, the Mid-West has been affected adversely also by the operation of the Panama Canal. Cheapened water transportation has brought the coasts of the United States relatively closer together at the same time that increased rail rates, figuratively speaking, have moved the Mid-West farther from seaboard. This situation has been expressed graphically by the setting up of a new measuring unit in the shape of the number of cents that it takes to move a ton of freight. By using this measuring unit, one may state that, for a certain manufacturer, these post-war influences have moved Chicago 336 cents away from the Pacific Coast, while New York has been moved 224 cents closer to the Pacific Coast. The Panama Canal affects industry directly more than it does agriculture, but the adverse effect upon Mid-West industry is reflected in its purchasing power of local agricultural products.

## Effects of Transportation Factors

All of the transportation factors heretofore mentioned, operate recip-

rocally and not only impose a handicap on the outbound products of the Mid-West, but also add to the cost of inbound supplies. In other words, the farmer gets less for what he sells and pays more for what he buys.

As a result of the great amount of study that has been given the subject of agricultural relief, many thinkers along economic lines have come to the conclusion that, as transportation has been such an important influence in bringing about economic distortion, any development that would result in a reduction of transportation rates would tend, largely, to restore the Mid-West to its former favorable economic condition. It has been very strongly urged that inland waterway transportation presents a sure remedy. As waterways offer cheaper transportation than rail, it is contended that here is the means to give to the Mid-West farmer and manufacturer cheaper access to the ocean. The Panama Canal cannot be closed; the railroad rates cannot be reduced without impairing disastrously the usefulness of our carriers, but inland waterway transportation offers the Mid-West producer a substantial rate advantage which will enable him to compete more successfully in the markets of the world.

At this juncture, it is important to bear in mind that incidences of freight do not benefit, entirely, the producer or consumer; the results of marketing are not as simple as that. As a matter of fact, each marketing transaction is a separate entity in which many factors are involved. Furthermore, any change of freight rates, whether it be a gain or a burden, affects the producer and consumer in varying proportions; sometimes the producer gains all the benefit, at other times the consumer; however, quite generally the difference in freight cost is divided between the two in varying proportions. It is also equally true that producers in the least advantageous situations and farthest from the market are most seriously affected; since this is the position of the American farmer, transportation changes have affected him vitally. While we cannot ignore the economic principle that a marked reduction in transportation rates has a tendency to increase acreage and thus augment supply; nevertheless, the conclusion is inevitable that cheapening transportation by means of inland waterways will improve greatly the position of the Mid-West farmer in marketing his products.

In addition to the obvious advantages of water transportation over railroad transportation, it is important to note that the advances in the cost of labor and materials since the war have necessitated great increases in railway rates; yet the increased costs are less in the case of waterborne traffic than in rail traffic because labor and material on the waterways are employed in less ratio to the tonnage carried.

A comparison of the relative costs of rail and water traffic has been stated by Mr. Hoover in the following words:

> Broadly, if we have back loading, 1,000 bushels of wheat can be transported 1,000 miles on the Great Lakes and on the sea for $20 to $30; it can be done on a modern equipped Mississippi barge for $60 to $70 and it costs by rail $150 to $200.

## INLAND WATERWAY TRANSPORTATION

Concerning inland waterway transportation, many routes have been suggested and studied out, thus far, the greatest success has been achieved on the Mississippi River. On this waterway, the Federal Government has been conducting a barge service since 1919. This service was operated

directly by the War Department up to June 3, 1924, and thereafter by the Inland Waterways Corporation, a corporation in which all the stock is owned by the United States. Although the operation was conducted at great loss in the beginning, in the year 1927, there was transported 1,650,207 tons of cargo at an income, before depreciation, of $384,909.64.

The statement of operating results discloses that the Inland Waterways Corporation is an important factor in the transportation of the Mississippi Valley. It is interesting to note the following statement issued by the Corporation, February 12, 1927:

> In 1926, the operations of this Corporation saved the shippers of the United States approximately one and a half million dollars on freight rates, and through its cheap water rates on grain for export set the price, according to records of the St. Louis Merchants Exchange, so that the farmer received for his grain nearly 3 cents a bushel more than he would have otherwise received. This additional price of 3 cents per bushel was not alone confined to the grain shipped by the facilities of the barge line, but according to the statements of great grain dealers themselves, set the price at which the hundreds of millions of bushels exported were purchased from the farmer.

In spite of the progress made in inland waterway transportation on the Mississippi River and the great possibilities it seems to offer in the way of agricultural relief, fierce controversy rages continually as to whether or not such development is a justifiable endeavor. From many responsible sources—for instance, in bulletins of industrial associations and editorials in leading magazines—we are informed that an analysis of the records of the Inland Waterway Corporation reveals that it has never been operated at a profit from a strictly commercial standpoint, when one takes into consideration customary charges for interest, depreciation, insurance, taxes, etc. In fact, many go further and avow that inland waterway transportation is impossible of economic accomplishment.

In the light of this controversy concerning the practicability of inland waterway transportation, it is interesting to note the great object lesson of the development of this medium of transportation in Europe. In reviewing their situation, we find that European nations have had generations of experience with inland waterways and, according to their own testimony, have been strikingly successful in their operation.

### WATERWAYS IN EUROPE

Europe has exemplified the economic cycle introduced by the principle that water transportation is cheaper than rail transportation. Great industrial centers have been built up through the availability of cheap raw materials at the factories. Furthermore, the markets of these factories have been widened because of the low cost of production. Many a German city, as, for instance, Duisberg, Ruhrort, Mannheim, Frankfort, or Dusseldorf, has become a great manufacturing center because of the inland waterways. It follows, inevitably, that cheap transportation by water for low grade raw materials at any point will make industries thrive at that location. As a corollary to this situation, all forms of transportation will benefit through the increased traffic occasioned by the distribution of the finished products. Further than this, by this development of industry in the interior, industry is built in the midst of agriculture and, conversely, the consumption of agricultural products is increased without long transportation hauls.

In examining the details of the water-

ways of Europe, the Rhine system is, undoubtedly, the most striking; it illustrates very clearly the influence of waterways on national prosperity. It is, also, a most important example of an internationalized river, being largely regulated by the Central Commission for Rhine Navigation with headquarters at Strasbourg. This commission was organized pursuant to the Congress of Vienna in 1815; its reports and those of the German, Dutch and Belgian railways furnish abundant source material. From these reports we find the following concerning Rhine traffic:

*Coal.*—From 1913 to 1925, the increase in down-stream coal traffic was slight, the movement for both years approximating 20,000,000 tons; however, the proportion carried by water increased from 61 to 86 per cent.

*Iron Ore.*—In 1925, the traffic was 8,100,000 tons, a decrease of 7 per cent from 1913; however, rail competition has nearly disappeared on this commodity.

*Iron and Steel Manufacture.*—In 1925, nearly 2,000,000 tons were exported through Dutch and Belgian ports of which 93.1 per cent arrived by the Rhine; whereas, in 1913 with practically the same exports, 61.2 per cent moved by the Rhine. These figures are highly significant, since they indicate the trend toward water carriage, notwithstanding that time is a great factor in the delivery of much of this manufactured iron and steel.

*Salt.*—In 1925, 135,000 tons were transported; an increase of 31.1 per cent over 1913. Rail competition was negligible.

*Sugars.*—In 1925, 825,000 tons were divided almost equally between rail and the Rhine; however, from 1913 to 1925, water traffic increased 30.6 per cent and rail traffic decreased 5.7 per cent.

As a further indication of the nature of Rhine traffic, we find that a majority of the tonnage of the following commodities moved by this route: Cereals and cereal products, coffee, tea, cocoa, paper and paper products, raw tobacco, lead, zinc, other base metals and products, cement, etc. It is interesting to note that, in 1925, Rhine traffic exceeded 42,000,000 tons.

In the Netherlands freight movement is accomplished generally by water; in fact, the annual reports show that the movement is three and one-half times greater by water than by rail. This condition can be understood readily from the fact that Netherlands railroads are approximately 1,500 kilometers while there are 27 rivers of 1,000 kilometers and 270 canals and waterways of 3,660 kilometers.

In 1926 all Dutch ports handled sea-going traffic of over 49,000,000 metric tons and river and canal traffic of about 48,000,000 metric tons. For Rotterdam the traffic was 37,000,000 tons and 30,000,000 tons respectively. These figures show that in the Netherlands transportation by inland water routes is only slightly less in volume than that of sea-going traffic.

The reason for this preponderance of inland waterway traffic is found in the following particulars of a typical freight movement of a shipment of 100 kilos (220 pounds) from Rotterdam to Groningen, a distance of 225 kilometers (140 miles):

Express rail, $2.50 delivered in 1 day.
Ordinary rail, $1.20 delivered in 5 to 6 days.
Water, 30 cents delivered in 3 days.

The maritime status of Belgium is disclosed, to a very large extent, by an examination of the activities of Antwerp, its chief port; in fact, its only port of major importance. The inland

water transportation facilities connecting Antwerp with centers of consumption and distribution constitutes one of the most important factors contributing to its greatness as a port.

Antwerp not only serves the drainage basin of the river Scheldt and Lys, but also those of the Meuse, Sambre, and Rhine. These rivers are connected by canals which, in Belgium territory, have a length of 2,370 kilometers (1,473 miles). The Rhine communicates with the Scheldt by means of the maritime canal of Hansweert. The Belgium Government tows, free of charge, all canal vessels proceeding from Antwerp to Dortrecht and return. By doing this, Antwerp is enabled to get a large share of the Rhineland traffic. The inland waterway traffic of Antwerp is approximately one-half its sea-going traffic.

The great object lesson to be deduced from Antwerp's experience is that cheapness of inland waterway transportation enables Antwerp to compete with even such distant ports as Genoa for the export and import trade of Switzerland and the north of Italy.

We have already examined in some detail the Rhine traffic; however, we have now to consider the importance of inland waterway transportation in Germany, as a whole, and, especially, with reference to its greatest commercial city, and also its greatest port, namely, Hamburg.

The length of the inland waterways *in operation* in Germany is estimated at 3,850 miles; it is estimated further that the inland waterways carry about 75 per cent of the bulk cargo, such as coal, ore, earths, timber, and building stones. There are approximately 132 more or less important inland waterway ports in Germany, all of which are equipped with extensive facilities for transshipment from barge to railroad and vice versa. The aggregate amount of goods handled on the German waterways in 1925 was 85.6 million tons.

In considering the traffic of Hamburg, an outstanding feature is that Hamburg is connected by waterway with only about half of Germany. She has no connection with the Weser, Ems, Rhine and Danube systems. The result is that a part of Central European cargo traffic is diverted elsewhere, or is handled by railroad, at a higher rate of freight. It is highly significant that Hamburg is distinctly aware of this handicap and is feverishly taking steps to correct it by the construction of canals which will connect it with the river systems mentioned.

Concerning the traffic of Hamburg in 1926, we find that of incoming commodities 45 per cent arrived by sea-going vessels, 20 per cent by river craft and 35 per cent by rail. Of outgoing traffic 64 per cent left by sea-going vessels, 20 per cent by inland waterways and 16 per cent by rail—in other words, inland waterways handled within 6 per cent of the rail movement.

Turning to France, we find the great lesson to be derived is the notable effect of a definite national waterway policy. The inland transportation routes of France are the outgrowth of centuries of experience. After the Franco-Prussian War, however, France seriously set herself to evolve a definite waterway policy, recognized at that time as being indispensable. This resulted in the DeFreycinet Commission, which laid down the principles and policies which France has followed to this day. Very naturally, one of the great issues to be decided was the relation of the waterways to the railways. This was covered very explicitly in the DeFreycinet program, wherein it was prescribed that the railways

INLAND WATERWAY TRAFFIC

| | French | | | | German | | | |
|---|---|---|---|---|---|---|---|---|
| | 1913 | | 1924 | | 1913 | | 1925 | |
| | 1,000 Tons | Per Cent | 1,000 Tons | Per Cent | 1,000 Tons | Per Cent | 1,000 Tons | Per Cent |
| Coal, coke, peat | 13,071 | 31 | 12,338 | 33.5 | 31,881 | 32. | 35,801 | 41.8 |
| Construction materials and ores | 17,097 | 40.6 | 14,797 | 40.1 | 34,908 | 35.1 | 26,905 | 31.4 |
| Metallurgical materials, machinery | 2,418 | 5.8 | 1,538 | 4.2 | 4,131 | 4.1 | 4,222 | 5. |
| Total | 32,586 | 77.4 | 28,673 | 77.8 | 70,920 | 71.2 | 66,928 | 78.2 |
| Agriculture and food | 4,411 | 10.5 | 3,558 | 9.7 | 13,696 | 13.9 | 8,469 | 9.8 |
| Wood | 1,658 | 4.0 | 1,032 | 2.8 | 5,679 | 5.7 | 2,845 | 3.3 |
| Fertilizers | 1,551 | 3.7 | 1,507 | 4.1 | 2,838 | 2.8 | 2,316 | 2.7 |
| Total | 7,620 | 18.2 | 6,097 | 16.6 | 22,213 | 22.4 | 13,630 | 15.8 |
| Industrial products * | 1,500 | 3.6 | 1,622 | 4.4 | 3,960 | 3.9 | 3,293 | 3.8 |
| Miscellaneous | 333 | .8 | 451 | 1.2 | 2,526 | 2.5 | 1,872 | 2.2 |
| Total | 1,833 | 4.4 | 2,073 | 5.6 | 6,486 | 6.4 | 5,165 | 6.0 |
| Grand total | 42,039 | 100.0 | †36,843 | 100.0 | 99,619 | 100.0 | 85,723 | 100.0 |

* Chemicals, textiles, paper, hides, leather, pottery, glass, etc.
† 37,131 for 1925.
NOTE.—All tons are metric tons of 2,200 pounds.

and waterways should be coördinated; in other words, they should complement each other.

As a result of this comprehensive policy, in 1926, the inland waterway system of France carried approximately 40,000,000 metric tons of freight, about one-fourth of the rail movement. The French people regard the waterways as a priceless heritage, and, as such, an object for safeguarding by the government for all the people for all time.

The nations of Europe, generally, are keenly alive to the importance of inland navigation; this is evidenced by the fact that the first big task of the Committee for Communications and Transit of the League of Nations was an inquiry into the present position of inland navigation in Europe, with particular reference to the Rhine and the Danube, from the technical and, more particularly, from the commercial and administrative point of view. Incidentally, this work was entrusted to an American, Mr. Walker D. Hines, and was reported to the League in August, 1925. These two reports reiterate, in most emphatic manner, the importance of inland waterway navigation as a significant factor in national prosperity.

## OUR OPPORTUNITIES

In the light of this brief statement, it is evident that the United States can learn lessons of incalculable value

from European inland waterway experience. Many of their developments are of striking significance in their application to our problems; two of the most important should be emphasized.

First, the barge transportation on the Mississippi River has been mainly that of general cargo, the Federal Barge Line, during its nine years of existence, has refused generally to accept such commodities as coal, lumber, fertilizer, fertilizer material, cement, lime, salt, flour and sulphur. This policy is further disclosed by the traffic report of the Lower Mississippi Division, from St. Louis to New Orleans, of the Inland Waterways Corporation as follows:

| | *1926* | *1927* |
|---|---|---|
| Wheat | 10.82% | 15.17% |
| Bauxite Ore | 11.79 | 19.06 |
| Sugar | 29.60 | 30.40 |
| 98 Commodities | 44.15 | |
| General Merchandise (not specified) | 3.64 | 35.37 |
| | 100.00% | 100.00% |
| Tonnage | 1,044,649 | 1,237,452 |

In contrast to this situation, European inland waterway operation consists, mainly, of bulk materials transported at the cheapest possible rates.

On the preceding page is an analysis of the inland waterway traffic of France and Germany:

### INLAND WATERWAY TRAFFIC

Considering these foreign operations very carefully, we note that over 90 per cent of their traffic consists of the bulk materials which are disregarded by the Inland Waterway Corporation. Furthermore, the Europeans consider their operations so successful that they are doing everything in their power to extend their scope.

Some idea of the cheapness of European rates on bulk goods can be obtained from the following statement issued by the Department of Commerce:

MONTHLY AVERAGE FREIGHT RATES FROM RHINE-RUHR HARBORS TO MANNHEIM

(Average distance 225 miles)

(Charge in cents per metric ton of 2,200 pounds on lump goods)

| Month | 1913 | 1926 | 1927 |
|---|---|---|---|
| January | $0.25 | $0.33 | $0.24 |
| February | .21 | .25 | .24 |
| March | .23 | .15 | .20 |
| April | .19 | .12 | .16 |
| May | .19 | .20 | .15 |
| June | .30 | .28 | .19 |
| July | .22 | .48 | .23 |
| August | .19 | .42 | .24 |
| September | .20 | .019 * | .24 |
| October | .39 | .022 * | .24 |
| November | .29 | .28 | .29 |

* Daily rental.

Another important factor of European operation is that there is intensive competition between inland ports. In Europe, inland ports compete for barge line business in the same manner that our ocean ports compete for steamship traffic. The ports are generally owned municipally with millions of dollars expended in the construction of terminals with the best mechanical equipment. These ports are operated usually on a non-profit basis with costs amortized over a long period of years so as to render port charges extremely low. As has been stated, there are 132 such inland ports in Germany. As a part of our inland waterway policy every effort should be made to convince the cities on our rivers that they should form port districts and build terminals in the same manner as do our seaboard cities. The benefits to the merchants, manufacturers and the agricultural interests would be enormous, and would result from proper coördination of rail and water transportation and relieving

barge operators from the necessity of building or maintaining terminals.

The fundamental principles exemplified by European practice are:

1. Waterways are a great source of national prosperity.
2. They are a vital part of any national transportation system.
3. They must be safeguarded and coordinated with other transportation media.
4. Waterways build up industry in the midst of agriculture.
5. They increase the consumption of agricultural products without long transportation hauls.
6. They bring about a more equal distribution of population.
7. With developed waterways systems, with regular and reliable service, the railways find joint rates to their advantage.
8. In a narrow sense—expenditure on waterways is a reproductive expenditure, which increases the wealth of the country many times their cost, and even increases the area of tax distribution; so, in the end, are an actual economy to the government.
9. Above all, European experience emphasizes that waterways furnish the cheapest form of transportation.

Nowhere in the world has Providence been more beneficent in waterway resources than in America; in our Mississippi system we have opportunities for development beyond the fondest dreams of any European operator. In this domain we have lying before us the key to the solution of many of our greatest agricultural and industrial problems. We would be sadly remiss if we failed to profit by Europe's most illuminating experience.

# The St. Lawrence Waterway

By G. P. Pillsbury

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THE St. Lawrence River is the outlet of those inland seas, known as the Great Lakes, that reach a third of the way across the North American continent. The river lies for some 115 miles along the boundary between the United States and Canada. For the remainder of its course, some 400 miles in length, it lies wholly within Canadian territory.

Deep draft ocean shipping now reaches up the river to the port of Montreal, 183 miles by river from Lake Ontario, the lowermost of the Great Lakes. Montreal enjoys, indeed, the distinction of being the largest grain shipping port of North America. The proposal to make this remaining 183 miles of river available for deep draft shipping is the project known as the St. Lawrence Waterway.

The St. Lawrence enjoys a unique position in being a great river without floods and without low water. The Great Lakes absorb the excess rainfall that creates the floods of other rivers, and distribute it in a steady flow, of large volume, through the year. As a consequence the river, even in much of its course between Lake Ontario and Montreal, has a natural broad and deep channel, ample for any shipping. Between these wide and deep reaches, however, the river, in its course from Lake Ontario, to Montreal, tumbles down three sets of rapids. These form the present bar which prevents deep draft vessels from reaching the Great Lakes. One of these rapid sections, extending over some 50 miles of river, lies in the portion which forms the international boundary. The other two, much shorter, but generally more abrupt, lie in Canadian territory.

The Canadian Government has already constructed on her own side of the boundary a series of canals around the rapids, capable of accommodating vessels of 14-foot draft. Through these canals passes most of the grain which reaches Montreal for export. The amount of grain transported through the St. Lawrence Canals to Montreal in 1927 is reported at 154,000,000 bushels.

The grain which moves down the St. Lawrence is loaded on the large lake cargo-carrying vessels at the grain shipping ports at the head of the Great Lakes, transferred to elevators at the foot of the lakes, reloaded on the smaller canal vessels, and transported down the river to Montreal, where it is again unloaded into elevators for delivery to ocean vessels. The present transfer point between lake and canal vessels is at the foot of Lake Erie, whence the canal-going vessels drop through the 24 locks of the old Welland Canal down to the level of Lake Ontario, and cross that lake to the entrance to the St. Lawrence. Within a few years, Canada will have completed the new Welland Ship Canal, with but 7 locks, comparable in size with the locks on the Panama Canal. The large lake freighters will then pass through this canal and across Lake Ontario, and will transfer their loads to the canal vessels at elevators at the foot of that lake, or in the head of the St. Lawrence. There will still be, however, a double transfer of cargo between the head of the lakes and the ocean.

### ENGINEERING PROBLEMS

There are no insuperable engineering problems involved in overcoming the rapids of the St. Lawrence and in opening the Great Lakes to deep draft shipping from the sea. Plans and estimates for such an improvement were prepared by a joint board of engineers, appointed by the two countries in 1920, and were reviewed, revised and elaborated by an enlarged joint board in a report made in 1926. The long reach of rapid water along the international boundary can be converted into deep quiet channels by the construction of a dam across the river, with locks for the passage of deep draft vessels. Either one high dam or two successive ones of less height may be used for the purpose. Either plan would concentrate the fall of the river and make available the development of upward of 2,000,000 horsepower. The value of this power would, in large part, meet the cost of the construction required. The other rapids can be similarly treated, or canals may be constructed around them.

The total cost of the improvement of the river, between Lake Ontario and Montreal, to afford a navigation channel 27 feet in depth, including the cost of developing approximately 2,600,000 horsepower of hydroelectric power in connection therewith, is estimated at from $400,000,000 to $435,000,000, depending on the exact form of improvement adopted. Of this cost the charges properly attributable to navigation improvement is taken as at from $123,000,000 to $148,000,000.

The combined improvement of the river for navigation and for power development will afford superior navigation at less cost to navigation than would an improvement for navigation only, by means of ship canals around the rapids.

It may be pointed out that the eventual power development on the St. Lawrence between Lake Ontario and Montreal will probably reach a total of 5,000,000 installed horsepower. Only so much of the power development as can be profitably combined with the improvement of the river for navigation is included in the estimates just given.

### IMPROVEMENT RECOMMENDED

The plans for improvement recommended by the international joint board of engineers for the improvement of the 183 miles of river from Lake Ontario to Montreal will afford a safe and convenient navigation route with but 25 miles or less of restricted canal navigation and not more than 9 locks. The remainder of the route affords unrestricted navigation through open river channels. The channel will be crossed by but eight bridges, at which ample draw spans will be provided.

With the improvement outlined, the large lake cargo vessels could deliver grain at Montreal at materially less cost than is possible at present, with the transfer to small vessels for transportation down the river. For deep sea vessels to ascend to the head of the lakes, further work is, however, necessary, for the channels between these lakes must be deepened.

Lake Ontario lies at the foot of the Niagara escarpment, 326 feet below the level of Lake Erie. The new Welland Ship Canal will afford the means for the passage between Lake Erie and Lake Ontario. While initially constructed for a depth of 25 feet, it can be readily enlarged to afford 27 feet depth. Its estimated cost, when completed, is $115,000,000. Completion in the near future is anticipated.

The channels between the other lakes have been excavated to afford navigation by vessels of 20-foot draft only. To deepen them to 27 feet,

which is sufficient for an ocean freighter of medium size, is estimated to cost about $64,000,000. The total expenditure required to secure a channel of 27 feet depth to the head of the lakes, including the cost of the Welland Canal and including also the cost of the power development that can be profitably combined with navigation improvement on the St. Lawrence, is approximately $578,000,000 to $600,000,000. Of this great total it is to be recollected, however, that $277,000,000 represents the value of the power generated on the St. Lawrence, and $115,000,000 the expenditure already undertaken by the Canadian Government on the Welland Canal, so that the new expenditure for the purposes of navigation become approximately $186,000,000 to $200,000,000.

The estimates have been presented for channels 27 feet in depth for the reason that this depth has been tentatively agreed upon by the two nations concerned as a basis for the negotiations relating to the undertaking of the improvement. It is the depth that can be obtained, at relatively little additional expense, in the Welland Canal. The great items of cost on the St. Lawrence Waterway proper are for dams, locks, and related work, rather than for the excavation of channels for navigation, and, within bounds, the cost is not greatly affected by the depth provided. The cost of deepening the channels between the lakes above Lake Erie increases rapidly, however, as the depth to be provided increases.

### FEASIBILITY OF NAVIGATION

As to the feasibility of navigating the waterway, once it is provided, there can be not the slightest question. It is true that, on account of fogs and ice, the lower St. Lawrence affords a navigation route perhaps somewhat less safe than the routes to more southern ports of the continent; and it is true also that the St. Lawrence is closed by ice during the winter. Vessels plying up the lower river to Montreal have, however, made that city the premier port of the continent in the grain trade. Montreal has a passenger and general cargo business envied by many of the larger ports of the United States. The navigation of the lower St. Lawrence is not a new and untried venture, and will be no bar to the use of the St. Lawrence Waterway. It is closed by ice only for substantially the same period that the lakes themselves are closed.

A ship ascending from the sea to the harbor of Duluth-Superior at the head of Lake Superior, or to the corresponding Canadian grain harbors at Fort William-Port Arthur, will have to pass through 8 or 9 lift locks in the St. Lawrence Waterway, 7 in the Welland Canal and one more at the Soo, between Lake Superior and Lake Huron, a total of 16 or 17. The six lockages required in the passage of a vessel through the Panama Canal have been found, however, to be but an incident in the transit through that canal. The routine use of the Panama locks, without accident or delay, by the merchant ships of all nations of the world, has removed any fear that the passage through locks will deter a vessel from making a voyage.

The distance from Duluth-Superior to Liverpool is certainly much greater than the distance from New York to Liverpool, but the added distance will not prevent the use of shipping for the transportation of commodities. It is well known that ship transportation between the east and west coast of the United States, through the Panama Canal, has such an advantage over the far shorter direct across-country rail shipment as to have deeply affected the fabric of our transportation system, to

the disadvantage of the region about the Great Lakes.

Granting the feasibility of the St. Lawrence Waterway, will the transportation savings pay for the great expenditure necessary to carrry out the undertaking? This question was carefully considered by a special advisory committee, appointed by President Coolidge in 1924, and headed by Mr. Herbert Hoover, now President, then Secretary of Commerce. This commission found that the carrying charges on the navigation improvement of the St. Lawrence Waterway, *i.e.*, interest, maintenance, and operation of locks, etc., would be 43 cents per ton of freight carried, or about one cent per bushel of grain. The minimum estimated saving in transportation costs is 3 cents a bushel, and many authorities place the estimated saving at a much higher figure.

### WELL WORTH THE EXPENDITURE

Despite the great sums requisite for its undertaking, the St. Lawrence Waterway would be well worth the expenditure.

The construction of the St. Lawrence Waterway is, however, a project in which another country besides our own is very vitally concerned. No portion of the river's course lies wholly within our own borders, and a large part of it lies wholly in Canada. The St. Lawrence Waterway is essentially an international, and not a national undertaking.

The friendly feeling universally held in the United States toward our neighbors to the north may lead us to forget that, just as we would not tolerate any construction by a foreign government within our borders, so will Canada insist that works within her borders be Canadian. It appears, however, that a fairly equitable division of the cost of a channel from the head of the lakes to the sea can be accomplished if the work on the boundary be done by the United States, and that wholly within Canadian territory by Canada, and such a division might form a reasonable basis for carrying out the work as a joint undertaking. Again, it has been suggested that an international corporation, whose personnel would be chosen by the two governments, might carry out the undertaking. Such a corporation would be subject to the laws of each country in which it operated, and its activities would not result in the intrusion of a foreign sovereignty into the territory of either nation. It may well be found the most feasible method of operation. However, the negotiations between the two countries as to the construction of the waterway have not yet progressed to such a stage as to warrant the assurance that a mutually satisfactory agreement will be reached in the near future.

It may be observed that the St. Lawrence, while undoubtedly the cheapest and best route between the Great Lakes and the sea, is not the only possible route. A ship canal across New York State from Lake Ontario to the Hudson River is a possible alternative. Its estimated cost for navigation works alone, between Lake Ontario and the Hudson River, is, however, $506,000,000, or about four times that chargeable to the navigation improvement of the St. Lawrence Waterway. It would have 137 miles of canal navigation and 20 locks as compared with 25 miles of canal and 9 locks on the St. Lawrence Waterway, and it would be crossed by many more bridges, whose draws would have to be opened for the passage of each ship.

For these reasons the Advisory Committee to the President, in reporting on a shipway from the Great Lakes to the sea, after arriving at the conclusion that such a shipway is imperative for the

relief and for the future development of a vast area in the interior of the continent, found that it should be constructed on the St. Lawrence route, provided that suitable agreement can be made for a joint undertaking with the Dominion of Canada.

The relation of the St. Lawrence Waterway to farm relief is obvious. The price which the farmer receives for his grain is the price of the grain at the market, less the cost of getting it to the market, this including the direct cost of actual transportation and the middleman's brokerage, and other indirect charges involved in the transaction. No matter what may be done to reduce the indirect charges, direct the costs of transportation must be met. Anything which can be done to cheapen the cost of transportation between the interior region, which is the seat of our farming industry, and the sea, over which the world's markets are reached, will benefit the farmer. His competitors, in Argentine and Australia, have grain fields close to the seaboard. The St. Lawrence Waterway will extend the seaboard into the Great Lakes, and will place our own grain fields as close to ocean shipping. There can be little question that the execution of this project would be an effective and practical form of farm relief.

# Recent Migrations of Industries in the United States

By Richard H. Lansburgh

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NOT only industrial executives, but the general public has been much interested during the last few years in the changes in location of manufacturing and mining industries in the United States. That the Middle West, in the past two decades, has developed to a position of dominance in manufacturing is very well understood, as are trends which are making certain states of the South great manufacturing centers. Now and again the diffusion of manufacturing throughout the country is evidenced by the announcement that a large corporation, whose main plants are in the East or Middle West, is building a large manufacturing unit on the Pacific coast. The development of new manufacturing centers, and the shift in leadership in manufacturing to the Middle West, are having profound influences on the economic and social life of the people of the older manufacturing regions, as well as on the life of the people of these new centers.

## Transportation a Factor

The ease of transportation of commodities in the United States has always been one of the principal reasons for the development of the United States as a manufacturing country. Nevertheless, until very recently the location of manufacturing establishments has been determined frequently by the proximity to raw materials, or to market. Other major locating factors have been the availability of a skilled labor supply, or of a large quantity of unskilled labor; and a location near sources of fuel or power. Particularly favorable locations have been those which reduced the mine-to-plant coal haulage costs to a minimum. In bituminous coal mining, those mines were opened first which were nearest the then manufacturing regions. Much of the present overdevelopment of the bituminous coal industry in this country is due to the betterment of transportation facilities, and the revision of freight rates which have made possible competition in the manufacturing markets of the United States by the mines in the newer regions of Kentucky, West Virginia, and Virginia, with the older mining regions of Pennsylvania, Ohio, and Illinois.

Numerous economic conditions have changed the importance of each of these major factors of location and in certain cases have practically eliminated one of them as a factor in the location of a specific industry.

Through the growth of chemical and mechanical research in industry, the raw materials which go into the manufacturing of the finished product are no longer as simple and no longer come from as few sources as they did only a few years ago. It is usual to find the raw material for a manufacturing plant coming from almost every section of the globe. In those industries in which this is not the case, it is very usual to find that the raw material is the product of other manufacturing establishments located in many sections of the United States, except in industries which use very bulky and comparatively cheap raw material, such as iron manufacturing. There is little pull any longer towards the source of raw

material as a locating factor. Even the migration of the cotton industry from New England and the Middle Atlantic states to the South has been influenced but little by the fact that cotton is grown nearer to the new sites of the cotton spinning plants. In many cases, the cost of transportation of the finished cotton goods to market is so much higher from the South than from the northern manufacturing plants, that it is a greater amount than any benefits coming from the lower transportation costs on raw cotton from the fields to the factory in the South. Moreover, this latter cost is, in some cases, as large, or even larger, than in the North, because the haul to the cotton manufacturing plant of the South is an all rail haul whereas to the North it is a water haul, or a combined water and rail haul.

In industries which use as raw material the products of other manufacturing industries the betterment of transportation methods makes location near the plants of other raw material manufacturers less important. There is also less tendency for these raw material manufacturers to locate near the plant of the final user of the material. It is not unusual now in the automobile industry to rely so closely on the making of schedules of haulage by the railroads, that manufacturing material is taken directly from the freight cars on the siding at the automobile plant and placed into fabrication or assembly without moving to any storage point within the plant. The speeding up of rail transportation which has made this possible manifestly makes location near raw material supply centers far less important than it was formerly. Not only has railroad transportation been bettered, but the use of truck transportation for short hauls has been an important factor in making it possible for small plants supplying others in the general community to move into outlying areas and small neighboring towns. Airplane transportation is coming to be a real factor for quick deliveries of small parts, in the Middle West. One forge plant in Chicago had delivered in 1928 a daily average of over two hundred pounds of small forgings to Detroit by airplane. Of course, these were emergency orders, but the airplane became another factor in wiping out the difficulty of the Chicago forge plant competing in Detroit with Detroit companies.

### COMPETITIVE CONDITIONS

Although better transportation is also a factor in decreasing the importance of nearness to market as a manufacturing necessity, there is another factor which is more important even than transportation in this case. Most markets for manufactured products in this country are now nation-wide. Competitive conditions have led to the branding of products and national advertising of that brand. Unless national distribution be effective there is much waste in the national advertising campaign. Both on goods which are sold directly to the consumer and those sold directly to the manufacturer, service and quick delivery have come to be of paramount importance through competitive conditions. The buying habits of the people of the United States have changed in the last few years. There has come into industry what is known as hand-to-mouth buying. This has developed very largely since the business depression of 1921 convinced jobbers and retailers that the last thing that it was profitable to do was to maintain large inventories of goods, in prospect of sales. Since many industries of the United States can produce a total product which is considerably above the normal demand for that product, it

follows that the manufacturer who gives the best service or delivery will get the business, prices being equal. This has led both to the establishment of a large number of distributing warehouses by manufacturers, and to the creation of branch plants strategically located throughout the territories of greatest sales. It is also a factor in the development of mergers, the combined companies having plants in the various sections of the United States.

### ESTABLISHING NEW PLANTS

In certain industries, such as cement manufacture, the bulk of the raw material and fuel which is used as well as the bulk of the finished product necessitates a similar wide distribution of manufacturing units. Thus one of the largest of the cement manufacturing companies has over twenty factories in the United States. Many of these have been opened in recent years and have provided new sources of work for the people in their communities. This is particularly true because cement plants tend to locate in the country near their quarries. In the present wide distribution of shoe manufacture the widespread sources of raw material have also been a factor. Leather for the shoe uppers is largely imported and is tanned in seaboard cities, while the leather for the soles is largely of domestic origin and is tanned in interior centers near large sources of supply, such as the stockyards of Chicago. It is but natural, therefore, that the New England shoe manufacturing centers have not had sufficient strength, because of the proximity of raw materials, to withstand the strength of some of the interior districts in labor supply and other factors.

In most industries during the nineteenth century the existence of an adequate skilled labor supply was an important factor in the establishment of a new plant. Men starting manufacturing businesses in the shoe industry would tend to go to Massachusetts, where they could find skilled labor which might become the key for their manufacturing operations. Men establishing manufacturing plants to weave textile fabrics probably would go into eastern Massachusetts or Rhode Island, or into the Philadelphia district. There they could find skilled weavers and beamers who were necessary to the prompt production of quality goods at low cost. Men establishing metal plants would be likely to go in a community where operators of machine tools were available. The skills in operating these tools were developed through years of apprenticeship and practice in machine shops.

The first great break from this scheme of location of metal working plants came during the period of greatest development in the automobile industry from 1910 to 1919. During this period, the supply of machinists for the automobile industry was so much smaller than the need, it became essential that old methods of manufacture be done away with, and new methods and new machines be quickly developed on which workers would need far less training than on the old machine tools. At the present time in the automobile industry, special manufacturing methods have been developed to such a point that labor is readily interchangeable between practically all mechanical operations, and there is little preliminary knowledge necessary prior to first employment in an automobile plant.

The great advantage, particularly the flexibility, which has been evidenced by this method of manufacture in the automobile industry, has had a profound influence on all industries utilizing machine tools for mass production, and many industries not

using machine tools at all, or to a minor extent. Every resource of industrial engineers and plant managers is today directed to the development of manufacturing operations which need a minimum of trained skill on the part of employees. Such effort includes industries such as textiles, woodworking, shoemaking, cigar making, and paper making. Engineering skill in process development has replaced labor skill in process performance. The development of the shoe industry in St. Louis and Milwaukee, the development of the textile industry in the South, and the development of paper manufacturing in Wisconsin, all point to the ease of securing labor supplies in districts which are otherwise favorable to manufacture, in cases where such labor supply is not already available.

The following table will indicate how the effect of the above factors has influenced migration of industries in recent years. The figures represent percentages of the total number of employees of each industry that the state named represents. This is the best criterion of the growth or decline of any given industry in a given section of the country. It will be noted that in certain industries, such as paper and pulp, there have been no marked increases in the number of employees in any given state, but rather decreases in all states listed. This indicates the general spread of the industry throughout the country and its growth in those states having small percentages of the total number of employees.

### POWER AN INFLUENCE IN LOCATION

The influence of power as a factor of industrial location has undergone the greatest change in recent years. Not only is coal available more promptly today than ever before from old sources of supply, but many new sources have been developed. Plants of any size were formerly dependent upon the ease of securing a coal supply as a means of power. Today executives of industry do not find this a problem since they generally use electrical energy from central stations of electric power companies. Whether this energy is obtained from steam plants or from water power plants by the electric company is immaterial to the industrial executive.

Electric power is now cheap, flexible and can be secured easily in most locations by merely signing a contract with the electric company. This has been one of the greatest single factors both in the migrations of industries from established industrial communities and in the movement of industries from congested city locations to the suburbs of cities, and into the smaller cities and country communities. Conversely, changes in fuel supply have in a few instances enabled industries to move into city locations which are more favorable for their purposes than country locations. For instance, in the manufacture of pig iron in blast furnaces different treatment of the coal has permitted the production of coke in urban communities, a thing which was formerly impossible with the old smoky beehive ovens. The by-product ovens now in general use emit but little smoke. It has therefore become natural to manufacture pig iron in large quantities at the lake ports. Here the iron ore brought by lake boats from the western end of Lake Superior meets the coal which has been hauled from the coal field for manufacture into by-product coke. The effect of this process change can be noted from the fact that in 1904 Pennsylvania gave employment to 39 per cent of the blast furnace employees of the country, Ohio 15 per cent, and Illinois and Indiana only a small number, while in 1925 Pennsylvania's blast furnaces employed

PERCENTAGE OF TOTAL EMPLOYEES OF PARTICULAR STATES TO TOTAL EMPLOYEES IN CERTAIN INDUSTRIES IN THE UNITED STATES

| | 1904 (per cent) | 1909 (per cent) | 1914 (per cent) | 1919 (per cent) | 1925 (per cent) |
|---|---|---|---|---|---|
| Paper and Wood Pulp: | | | | | |
| New York | 18 | 15 | 15 | 15 | 14 |
| Massachusetts | 17 | 16 | 15 | 12 | 11 |
| Maine | 11 | 11 | 11 | 12 | 10 |
| Wisconsin | 9 | 9 | 10 | 11 | 11 |
| Pennsylvania | 8 | 8 | 8 | 9 | 8 |
| Cotton Goods: | | | | | |
| Massachusetts | 27 | 28 | 30 | 28 | 21 |
| Rhode Island | 7 | 7 | 7 | 8 | 7 |
| New Hampshire | 6 | 5 | 6 | 5 | 3 |
| Pennsylvania | 4 | 4 | 3 | 3 | 3 |
| North Carolina | 11 | 12 | 14 | 15 | 18 |
| South Carolina | 11 | 11 | 12 | 11 | 14 |
| Georgia | 7 | 7 | 8 | 9 | 11 |
| Hosiery and Knit Goods: | | | | | |
| New York | 28 | 27 | 27 | 20 | 19 |
| Pennsylvania | 27 | 29 | 27 | 26 | 26 |
| Massachusetts | 7 | 7 | 7 | 7 | 6 |
| Wisconsin | 4 | 3 | 4 | 5 | 6 |
| Boots and Shoes: | | | | | |
| Massachusetts | 43 | 41 | 40 | 40 | 29 |
| New York | 10 | 11 | 13 | 16 | 18 |
| Missouri | 6 | 8 | 7 | 9 | 12 |
| Pennsylvania | 5 | 5 | 6 | 6 | 5 |
| Wisconsin | 2 | 2 | 3 | 4 | 5 |
| Foundry and Machine Shop: | | | | | |
| Pennsylvania | 18 | 16 | 15 | 15 | 14 |
| New York | 13 | 12 | 11 | 12 | 11 |
| Ohio | 12 | 12 | 14 | 15 | 14 |
| Illinois | 9 | 9 | 10 | 10 | 10 |
| Massachusetts | 7 | 8 | 9 | 6 | 5 |
| Connecticut | 6 | 6 | 4 | 4 | 4 |
| New Jersey | 5 | 5 | 5 | 5 | 5 |
| Michigan | 3 | 4 | 5 | 8 | 8 |
| Indiana | 2 | 2 | 3 | 4 | 4 |
| Automobiles, including Bodies and Parts: | | | | | |
| Michigan | 22 | 32 | 51 | 50 | 53 |
| Ohio | 22 | 15 | 14 | 13 | 10 |
| Wisconsin | 4 | 5 | 4 | 4 | 4 |
| New York | 15 | 11 | 10 | 8 | 6 |
| Pennsylvania | 4 | 4 | 2 | 4 | 4 |

only 27 per cent of the employees, Ohio 25 per cent, and Illinois and Indiana nearly 15 per cent.

### OTHER INFLUENCING FACTORS

Local conditions have always been a very great factor in determining exactly the point within an area at which a company would locate its plant. Inducements such as relief from taxes may have hastened the invasion of particular sections of the country by certain industries, but they have not been the primary cause. Business and

financial leaders in the South have made a definite effort to secure the removal of textile companies from the North to the South, and to this extent local conditions have probably been a larger factor in this removal than in most migrations. However, inducements and urgings come not only from those who would indirectly profit from the growth of manufacturing industry in the South, but by those who would directly benefit, such as electric power companies.

One of the greatest changes in location in manufacturing industries in recent years has been the movement from congested city areas to suburban and small town locations. As has already been noted this has largely been made possible by developments in the transportation field, but there have been other factors influencing it. Although this type of migration has not changed the major area in which a product is made, it has had great effect on the social and economic life of people in all particular manufacturing regions. The better working conditions which are made possible by the light and airy one-story buildings which may be erected on the cheap land away from high property values has meant much for the health of employees and for lower production costs. The better and cheaper living conditions and the urge towards ownership of an automobile which are experienced by employees of the outlying factory are all factors of great importance in the remaking of American social life.

Although the United States is still a great agricultural nation the development of manufacturing industries in new locations has made nearly every section of the country interested in the problems of manufacturing, and interested in getting new companies to locate in their territory. This influence has been felt not only in the new communities, but in the old communities where chambers of commerce have been awakened to the necessity of inducing new manufacturing organizations to locate within their borders. The South is as conscious of fundamental political problems affecting manufacturing as the New England states have been in the past. That this has influenced our political life is indicated by the results of the last presidential election. New alignments, politically, may be expected from the new locations of manufacturing industries which have been developed. The economic, social, and political life of the people of the United States is closely bound up with the significant changes which have been occurring in the basic factors of industrial location.

# The Outlook for Crop Insurance

By G. Wright Hoffman

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CROP insurance is still very much in the experimental stage. What promised to be, a few years ago, at least a partial solution to the farm problem continues only as a promise. It should not be implied from this that this form of insurance has lost ground; rather it has, in fact, decidedly gained ground in variety and continuity of experience. But it has not been applied on a wide scale to any one of our major crops since the pioneer experiments of 1917 and 1920, and it is in the major crops that the demand for permanent help is most urgently needed.

The writer reviewed in an article in *The Annals* for January, 1925,[1] what had been accomplished in the field of crop insurance up to that time. In the form of a blanket coverage, aside from a minor experiment in 1899, two important attempts had been made, in 1917 and in 1920, to write this line covering the leading crops. Neither attempt succeeded and for very definite reasons which will be touched upon later. Following these attempts, efforts were directed to the citrus fruit and truck gardening crops, with particular attention to the single hazard of frost. While efforts in this field were not, up to 1925, particularly successful as a financial venture for the insurer, they did not cost the underwriting companies a great sum and promised to develop a profitable field if they were able to correct some defects which their experience had developed.

[1] Hoffman, G. Wright, "Crop Insurance—Its Recent Accomplishments and Its Possibilities," *The Annals of the American Academy of Political and Social Science*, January 1925, pp. 94–120.

## Extent of Crop Insurance

At the close of 1928, three companies continue to write crop insurance in selected areas and for selected crops. This does not include, of course, the long list of companies writing hail insurance. This latter risk has now been successfully covered for many years and is well established. The three companies are attempting to successfully write a contract covering a major part or all of the long list of hazards to growing crops including drought, excess moisture, plant disease, insect pests, etc. It is a broad coverage of this type that is usually referred to as crop insurance, and it is because it does cover such a wide range of risk that it has been found particularly difficult to successfully write.

The areas and crops in which this insurance has been placed during the past four years include several states of the South and the Pacific Coast. The crops include citrus fruit in Florida, several kinds of truck garden crops such as tomatoes, celery, and peas, in the Carolinas and Georgia particularly. Less recently rice and sugar cane were covered in Louisiana, Texas and Arkansas. On the Pacific Coast, insurance is now available for a wide variety of crops and covering a long list of crop hazards, and during the past season a fair volume of business was written. The list of crops includes citrus fruit in the South, truck garden crops through the central part of the coast and in the northern states

of Oregon, Washington, and Idaho, grain and deciduous fruit.

But the length and variety of this list presents a more formidable appearance than it should. It is like the college whose catalog offers many courses but whose students are few. Compared with other lines of insurance, or with the possibilities of the field, this line of insurance has little more than made a start.

### INSURANCE HANDLED THROUGH COÖPERATIVE ASSOCIATIONS

We have already noted the fact that crop insurance in recent years has been localized principally in the two areas of the South Atlantic States and the Pacific Coast, and that it is being placed mainly on fruit and vegetables and not on the major crops. This concentration in limited areas and in crops yielding a high value per acre has afforded the advantage of careful supervision on the part of the company, a weakness which could not be overcome, in widely writing the line, without considerable expense.

To further aid in adequate supervision, the insurance in the South Atlantic area is also being placed through farm associations rather than directly with individual farmers. This has been accomplished through the use of a blanket contract between the insurance company and the coöperative association acting as agent for the individual farmers, which contract serves as a master policy for the entire risk. The inclusion of a particular risk is then evidenced by the issuance of a certificate to the farmer and, upon its approval by the company, he is insured subject to all of the stipulations and conditions of the master policy. The company thus deals directly with only one party and it is responsible only to this association.

The advantage of this method can easily be seen. The responsibility of the association is much greater than the average of its members as individuals. It is, also, in a far better position to bring to the insurance company a group of responsible applicants than the company could obtain through direct solicitation.

### CREDIT USE

To a considerable extent, also, it has become the practice in the South Atlantic area to use crop insurance to obtain more liberal credit facilities. The policy may be taken out by a bank or finance corporation directly, or it may be taken out by a farm association, and through the use of a loss payable clause, the proceeds of any loss assigned to the lender. In either case the immediate benefit of the insurance goes to the lending company but to the extent that the borrower's obligation is cancelled he is enabled to carry on another year. The ultimate benefit of the insurance thus rebounds to the grower. Where the policy is taken out by the bank or finance corporation, the borrower has to pay not only the usual rate of interest for his money but also from 5 per cent to 10 per cent more for the insurance; or if taken out by the grower through his association this extra insurance premium is paid to the insurance company directly instead of through the lender. This seems like a rather high total rate for the grower to pay, but it is paid only upon advances to meet current crop expenses such as fertilizer and seed. And in view of the fact that, without the insurance, borrowing on his crop prospect through open accounts with local merchants would also be expensive with no compensation if his crop turns out to be a total loss, it is felt to be not only safer but, in the long run, less expensive.

Crop policies used as a basis for credit and taken out by associations of growers are comparatively new and, being used for a variety of crops and to meet a wide range of requirements, are not as yet fully standardized. They usually insure, however, the main risks to which the crop is subject and for an amount sufficient to cover the prime costs of production. The usual hazards covered include drought, excess moisture, wind damage, insect and disease damage. Frost and freeze or hail may also be included or, as is usually the case, written under a separate form. The policy invariably denies liability on the part of the company for a group of undesirable contingencies. These include items relating to negligence on the part of the grower in properly taking care of his crop, difficulties growing out of the marketing of the crop, loss by fire, or quarantine or from any cause not specifically insured against.

While the contract generally states the maximum liability of the company per acre of crop covered, it is usual to add a clause further limiting payment to actual expenses. Thus one policy reads:

> This company shall not be liable for any greater amount of loss or damage per acre than the amount per acre which the assured has actually advanced to the grower, and which the grower has actually spent in making, and harvesting his crop, up to the date of occurrence of loss or damage.

There are, in addition, provisions outlining the procedure to be followed in the adjustment of any loss, the salvaging of the damaged crop, the keeping of accurate and complete records of all sales, together with the usual provisions common to insurance contracts.

This epitome of the provisions common to crop contracts now being used does not adequately show the complications which frequently arise in the adjustment of losses. What the farmer would like is a contract which will assure him, in the event of a full crop, or a partial crop, or a total failure, that he will receive from the sale of his crop, or from the insurance company, or from both, a sum sufficient to cover his expenses in growing his crop. This the company is glad to grant if his expenses are sufficiently small. But there is always present the possibility that, even with a good crop, expenses will exceed market value. In such a situation the tendency is to assert that the crop has been damaged by one of the enumerated hazards and claim the difference between the market value of the crop and the amount of the insurance. To avoid this "human equasion" element, the company is particularly careful to see that the amount of insurance granted per acre is a conservative percentage of the probable market value of the crop.

An illustration will help to make this point clear. Suppose grower K is in the truck garden business. He needs credit to meet his current expenses which is obtained by mortgaging and insuring his prospective crop in favor of the finance corporation granting the credit. At prevailing prices and with an average yield, he should have a crop worth $120 per acre and his operating expenses will probably be not more than $70 per acre. In a case of this sort, the insurance company might conservatively grant insurance to cover these expenses so that the lender would be protected up to the amount of its advances, and the grower, in the event of failure, would at least have his bare outlays met.

In the illustration here presented two points deserve emphasis. The first is that, for most crops, the margin of difference between current outlays

and market value is not as large in percentage as the illustration given. For fruit and produce, where the value per acre is high, there is a fairly wide margin, and it is for this reason that insurance can be granted for these crops. But for the leading crops of cotton and grain, the margin is much narrower both in dollars and in percentage, and to attempt to write insurance covering current expenses would be much more hazardous.

### THE PRICE HAZARD

The second point of importance in the illustration relates to the probable course of the price of the commodity during the period insured. If the assumption of prevailing prices fails to hold true as the season advances, the margin of difference between expenses and market value may become very small or be wholly wiped out. And this can occur despite the fact that the crop is of average size. In such a case the grower is likely to claim damage due to one of the many physical hazards insured against. If the claim is met the company is in reality paying for loss due to a risk not enumerated in the contract, the amount of the claim being the difference between the shipping-point value of the crop marketed and the amount of the insurance (or expenses incurred if smaller). In many cases, and particularly if the crop is substantially damaged, the payment of this type of claim is unavoidable.

This is a sensitive point with the companies who have experimented with this line. The thought is general with them that as far as possible the price hazard should be avoided. This is due in part to a belief that price insurance is, in a measure, synonymous with profits insurance and that the latter is unsound in principle. It is due in part, also, to the adverse experience of 1920 when insurance was widely written on grain and cotton. Because of the precipitous decline in prices that year, large losses were sustained. To avoid this particular hazard, novel and, at times, devious provisions have been inserted in the contract. In some instances this has caused ambiguity; in others it has led to dissatisfaction on the part of the insured at the time of adjustment. In this connection, there is being tried a plan of insurance on the Pacific Coast that deserves careful consideration. While somewhat complicated, the contract is clear and effectively eliminates the hazard of a price decline.

### PACIFIC COAST CROP CONTRACT

A determined effort is being made on the Pacific Coast to successfully work out a plan of crop insurance. Judging from the volume of business written during 1928, its distribution and the loss experience, more than average success is being attained. The pioneer work being done in this section is significant because of the wide range of crops being insured and the variety of protection being offered. The policy contract is of particular interest because of the manner in which the price hazard is handled and in general because it represents an attempt to work out a successful standardized form.

Several of the western states, including Washington, Idaho, Oregon, California and Arizona, have been organized by crops and by areas with appropriate schedules of rates. The crops covered include a long list among which are: citrus fruit, deciduous fruit, root crops, truck crops, grain and cotton. It will not be possible here to do more than describe the salient points of the contract in use at the present time. Because of the variety

of crops covered and the range of risks insured the contract is a rather long one. Being still in the experimental stage it is also rather heavily burdened with special stipulations and warranties.

Instead of the usual insuring clause, the contract provides a series of "insuring agreements" which gives the insured the privilege of selecting a type of cover particularly adapted to his locality and crop. This series includes the following groups:

Sec. A. Hail; rain; wind; excessive heat; flood from ditch breaks; pests; and disease.
Sec. B. Frost or freeze—spring.
Sec. C. Frost or freeze—winter.
Sec. D. Drought—subnormal precipitation.
Sec. E. Drought—failure of wells, pumping plant breakdowns and ditch breaks.
Sec. F. Drought—failure of irrigation supply from any cause.
Sec. G. Flood or seepage.

Exactly what is covered by each of these groups is carefully defined and fixed by provisions in the contract. Sections A and D are of particular importance to field crops, while B and C apply especially to horticultural crops. The last three groups are of benefit only in special situations. For each class of coverage elected, a premium charge is made, the amount per $100 of insurance varying widely between the various crops and regions.

It will aid in understanding the provisions of the policy to explain the additional features in the form of an illustration. Let us suppose that farmer K desires to insure 200 acres of wheat against the hazards enumerated in Sections A and D and that the basic rates for these two covers for his locality are $2.50 and $2.00 respectively. His total basic rate would then be $4.50 per $100 of insurance. From this rate specified deductions may be made for the fulfillment of certain conditions which decrease the hazard, and a surcharge is made if a larger percentage of the estimated yield than that covered by the basic rate is insured. We will omit both deductions and surcharge and assume the net rate to be $4.50.

The applicant is then asked to state the number of bushels per acre which his crop, if an average one, will likely yield, and to estimate the average f.o.b. price for the season which we will assume for our illustration to be 20 bushels per acre for the yield and $1.10 per bushel for the f.o.b. price. At the basic rate, the company then agrees to insure 50 per cent of this estimated yield. The amount of insurance would be 10 bushels × $1.10 per bushel × 200 acres, or $2,200 and the premium $99.00.

The company thus grants the insured a 50 per cent coverage amounting in the illustration to $11 per acre and, to the extent that his crop does not turn out to be worth that amount, it agrees to make up the difference. In the event of damage occurring early in the season, a graded percentage only of this amount is paid since the crop outlay up to that point has not been fully incurred.

The company's liability may be further reduced by the clause referred to in the preceding section designed to eliminate the hazard of a decline in market price. This clause reads as follows:

In the event that the amount of loss or damage to the crops, or any part thereof, herein described by the perils hereunder insured against shall warrant claim hereunder in accordance with the terms and conditions hereof, in case it shall be determined upon the adjustment of any such loss that the actual average of the market prices per unit (f.o.b. at the warehousing,

marketing or shipping point named in paragraph 4, on the face of the assured's application for this insurance during the six months period next preceding the termination date of this insurance on any such crop) paid for crops of like and kind and of quality and grade similar to that which said crops would have produced, had no such loss or damage thereto occurred, is less than the average price per unit estimated by the assured in the application for this insurance, the amount of insurance applying per unit thereon shall be reduced in the same proportion that the ascertained deficiency in such actual average price per unit bears to the estimated average price per unit, the amount of insurance applying per acre and, or on such crop to be reduced in the same proportion, and ratable portion of the premium to be returned to the assured in the event of such reduction in the amount of insurance.

This clause places the insurance on a basis of indemnity for physical damage only and removes from the contract any possibility of paying for damage at a price above the prevailing level. It is not unduly harsh, however, since the average price for the previous six months is used. Since the limit of insurance is only 50 per cent of an average crop this provision would rarely be used in any event.

There are clauses in the policy which give precision to the contract and others designed to meet particular problems, but they include details which need not be reviewed here. The premium rates vary widely, being as low as 25 cents per $100 of insurance for risks included under particular sections of the contract; and, if all of the hazards were covered for certain truck crops, the rates for some sections would run as high as $18 per $100 of insurance.

## STABILIZATION OF INCOME

The remainder of this article will be devoted to a consideration of proposals and problems in the field of insurance relating to the present agricultural situation. Viewed as a broad problem, what the farmer needs is stability of income. It is far better, both from an individual as well as a social point of view, to have an income each year of $3,000 than to have two years of $6,000 each followed by three of $1,000 each. The first situation permits of careful planning and provision for the future; the second stimulates business activity, increases land values and encourages speculation, only to be followed by a reaction bringing with it general unrest.

Instability of farm income is the direct result of three major factors: weather, plant and animal disease, and price. The first and most obvious line of attack would be to control these fundamental causes. But, to date, this has proven to be a difficult task and particularly with reference to weather and price. A measure of success has been attained in adapting crops to unfavorable localities, but we continue to be in large measure dependent upon the vagaries of climate; nor has there been as yet any notable development in the long-range forecasting of weather. The control of prices is still more difficult. Supply is the leading determinant of price for farm crops and here again variations are in part occasioned by weather conditions being only in part man-made. Nor has our knowledge of price forecasting advanced to a point where it can be widely used in predicting price changes to advantage.

To what extent, then, can we meet the problem of instability of income by means of insurance? Broadly speaking, insurance includes not only the assumption and distribution of risk, but also its elimination wherever possible. With reference to the farm problem, a determined effort has already been made, and it is fair to

assume that it will continue to be made, to meet this problem by elimination. But we cannot look to this source for sufficient additional help in the immediate future to meet the situation. If, then, insurance is to provide a method it must be based on the principle of distribution of risk.

We have already reviewed the progress which has been made in this country in the distribution of farm risk through crop insurance. This has met with a fair degree of success in local situations, but as a national program applied to our major crops, it has yet to be given a thorough trial. An attempt was made in 1917, principally in the Dakotas, to insure grain. It resulted in loss because of the incompetancy of agents in accepting risks. Another attempt was made in 1920 to insure the major crops and it was a failure, in part due to an adverse selection of risks and in part to a faulty plan of insurance. But while these experiments were financially unsuccessful, they serve, with the experience gained in selected crops and areas since 1920, to suggest desirable elements in any broad program designed to supply insurance. They also serve to remind one of points which should be avoided in any contemplated plan. Occasion is here taken to offer one or two suggestions regarding such a plan.

## TYPE OF COMPANY

Companies writing crop insurance on a large scale should be organized primarily for that purpose. Losses sustained in the past in this line have been by fire insurance companies writing this form only as a minor side line. Delegating the entire work of writing and supervising the insurance, including the final adjustment of losses, to a general agent, the company relieved itself of all responsibility beyond the crediting of premiums and the debiting of losses; and it hoped at the end of the year to find a credit balance. This is not intended as a criticism of the general agency plan but of the attitude of the company back of the agent or agents. To be a success, the insurance must be a vital part of the company's business as well as that of the agents. Treating the field only as a possible source of additional income will not accomplish this.

Companies should be of the corporate type with a popular subscription of the stock. To the extent that the original issues were not fully subscribed for, the Federal Government might purchase this balance to be disposed of later at the purchase price as demand developed. There are ample precedents for this procedure by the Government and it would assure the successful launching of the companies and at the same time leave them under private control and management.

Legislation necessary to carry out this plan would need to include detailed provision for the formation of agricultural insurance companies along commodity lines. There might be, for example, two companies for cotton, two for wheat, one each for corn, oats, rye and barley and for certain other crops and regions as the situation demanded. Each company would then devote its entire attention to the working out of sound forms of insurance to fit the particular needs of its crop and region including forms for fire, hail, frost and freeze, flood, damage by wind and storm, drought, loss of live stock, as well as the broader blanket coverages including a wide range of risk. For each form an appropriate premium would be charged. To aid in the distribution of risk between crops from year to year,

there should be a partial inter-holding of stock, or a pooling of excess profit above a minimum percentage of dividend allowed to those companies having for a particular year a favorable experience.

To this suggestion critics are likely to inquire about those years during which all of the companies might sustain losses above premiums received. This could happen and it is conceivable that it might continue to the ultimate failure of the plan. But since Congress has apparently decided to provide a fund of $300,000,000 to $400,000,000 to be used under some program of stabilization, it may reasonably be urged that the above plan could involve no greater loss than other projects being advanced while promising to provide a far more permanent and, in the long run, satisfactory solution.

A company formed for that particular purpose and writing in a particular crop is bound to acquire a more intimate knowledge of the details of the business than would otherwise be possible. Herein lies one of the most fundamental difficulties in the successful writing of agricultural forms of insurance, the acquiring of a detailed knowledge of the facts of each insured risk. To an equal extent this is sure to be a fundamental difficulty in the application of any plan of agricultural relief. Long-range farm relief in any form is certain to be an aid to the inefficient farmer and the dishonest farmer at the expense of the efficient and honest. Agricultural stabilization, if it is to be a success, must result in equalizing income not between farmers nor between crops, but between years for each individual farmer. To accomplish this, close and continued analysis must be a fundamental part of the plan.

### THE PRICE HAZARD

It is not possible here to enter into the separate phases of a contract in a comprehensive plan of insurance. The writer is of the belief, however, that there should be included in some form, for selected periods of time and under carefully defined conditions, insurance covering the hazard of a pronounced market decline in price. This would doubtless necessitate the carrying of a portion of the crop for certain seasons by certain companies and would require that they make definite provision therefor either in the formation of a department for that purpose or in the organization of subsidiary companies.

No program of agricultural stabilization is more than a partial plan which does not include the effective handling of the price hazard. The most obvious method of insuring this risk is to guarantee the insured a crop worth so many dollars per acre at harvest time and have the insurance come into force after the crop is under way. The company would then need to reckon the natural hazards and the price hazard for only a limited period of time.

The amount of insurance per acre should be a conservative fraction of its estimated value at harvest time. If more than this, premiums would become prohibitive and the temptation to use the insurance as a means of profit would be strong. Attempts have been made, and suggestions advanced, to insure costs of production. But this is unsound both in principle and practice. Were it undertaken, such a plan would only encourage extravagance and overproduction; but it is impossible to determine what constitutes cost of production per acre. It might be a good selling point to call insurance guaranteeing a cer-

tain value per acre "investment insurance" and to point out that this sum will be sufficient to meet the major part of the insured's current costs, but this is an entirely different matter from attempting to estimate, even roughly, the actual costs for particular cases and cover them by insurance.

Following the harvesting of the crop, the price hazard might be separately insured, though this is not an essential element to a comprehensive plan of insurance. Such a feature has been included as a part of the more recent McNary-Haugen bills including the one before Congress at the present time. This proposal was worked out by the president of a prominent cotton growers' association and provides for the insuring of the supplies being currently carried forward by such an association against a decline in the average market price of the commodity during the period carried.

The association, beginning with the harvesting of the crop, receives from its members various quantities of cotton and, from time to time, as the season advances and favorable opportunity affords, sells the supplies. Against the quantities it receives, it is able to borrow and safely advance to its members from 65 to 70 per cent of the prevailing market price. It is pointed out that were it able to obtain insurance guaranteeing that the average selling price of the association's cotton will not be less than the average price at the time of the receipt of the cotton, a larger percentage might be borrowed and safely advanced to the growers and that frequently this additional percentage is so important at harvest time to the member that he will sell elsewhere for cash if it cannot be advanced.

This is a proposal that, on first thought, appears rather hazardous for the insurer. But it should be borne in mind that the seasonal trend of spot prices is upward and this element operates to the insurer's advantage. To assure reliability in determining gains or losses, New Orleans prices are to be used.

As each delivery is made to the association, it is multiplied by the New Orleans average spot price of middling cotton and at the end of the crop year, on the following August 15, the aggregate value of all deliveries can then be determined by simply summing the values of all daily deliveries to the association. Similarly the aggregate of all sales for the crop year, using New Orleans prices, can be calculated. The insurer is liable only for years in which the aggregate sales figure is less than the aggregate deliveries figure. From calculations extending back thirty years, the author of the plan has found that the average loss per pound amounts to only ¼ cent per pound when three war years are eliminated. By loading this figure 100 per cent, the premium charge would still be very reasonable.

The proposal just reviewed is constructive in character and deserves careful consideration. It would serve as a valuable supplement to any general program of insuring growing crops.

### THE INSURANCE ATTITUDE

Crop insurance has never been given a broad, thoroughgoing trial. As a solution to the problem of stability of farm income, it deserves such a trial. It may not be applicable to all farm products nor to all of the many hazards, nor to all localities. Nor is it advanced as a method of providing a general increase to farm income. But it should serve in the regions and for those crops in which the need is great-

est and it should give to the insured a more balanced and dependable income.

To successfully put into practice such a program will require not only the creation of the appropriate machinery but also the development of a proper attitude on the part of the insured. Insurance in all its forms must be sold. And the selling consists of proving to the insured that a dependable income with a measure of safety is far better in the long run, than a large income for some years with a deficit for others. To put across this idea with the farmer, whose business life is of necessity a highly speculative one, is not an easy task. But it is by no means an impossible one, and there is ample evidence to show that properly presented it would be met with favor.

# The General Property Tax as a Factor in the Unsatisfactory Agricultural Situation

By F. P. Weaver

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THE major adjustments in farming which have been necessitated by the changed economic conditions existing since the World War must, no doubt, be made within the farmer's own gates. In these adjustments the farmer has little to expect from legislation that will help him except the continued availability of such technical and economic information as will enable him to make the necessary changes most wisely.

Of the things that are outside the farmer's own gates, those with which he can not hope to cope successfully as an individual, and for which government aid must be invoked if relief is to come, the most outstanding problem is that caused by the excessive tax burden on farm property in general and, especially, on farm real estate. No problem which confronts the farmer has so much ethical and economic justification for relief by legislation as has the tax problem. Adjustments in bases for taxation to keep pace with changes in the types and sources of incomes of the people, like most economic adjustments, are at least one or two generations behind the changes to which these adjustments tend to conform. The general property tax, at one time the sole source of income to the ruling class, still constitutes too large a share of the source of all taxes.

Not only is too large a share of all tax burdens resting upon general property but, because of administrative difficulties, real estate bears an undue share of the general property tax due to the inherent difficulty of reaching all intangible property.

In relation to the volume of business carried on, agriculture is outstanding among all modern occupations for the large amount of real estate that is used in its connection. Farm surveys and farm accounts throughout the United States show that the average farm turns its entire capital about once in six years. The farmers of Pennsylvania in 1925, with an invested capital of one and one-half billions of dollars, of which almost one and one-quarter billions was in land and buildings, produced products worth $318,700,000. All products were valued at only a trifle more than 20 per cent of the invested capital and at just about one-fourth of the estimated value of land and buildings in Pennsylvania farms.

With this return per dollar of invested capital in agriculture, note the following comparisons: The motion picture industry in America had invested in 1925 just about the same amount of money as was invested in Pennsylvania farming, $1,250,000,000 in theatres and $250,000,000 in studios and distribution offices. The box receipts in this country, however, were more than twice the gross value of all farm products produced in this state, and in addition, there was considerable revenue from the use of American pictures in foreign countries.[1] In proportion to capital invested the total gross revenue to the American moving picture industry was, therefore, about three times as high as for Pennsylvania agriculture.

The manufacturing industry, on the

[1] Johnston, William A., *The Annals*, Vol. CXXVIII, No. 217, Nov., 1926.

other hand annually produces manufactured goods valued at approximately 100 per cent of the capital invested in manufacturing. In this state, it amounted to $6,900,000,000 in 1925.[2] This can not all be considered as the gross value produced by manufacturing but deducting the value of the raw materials entering into manufactured goods, we find that there was in 1925 an addition of value of about three billions of dollars with invested capital of about eight billions, but with actual cash value of the property assets of three and one-half billions.

The construction industry, which uses practically no real estate, had in Pennsylvania in 1922 about $125,000,000 invested and produced a volume of new construction valued at over $400,000,000.[3] Here again, allowance must be made for a larger ratio of raw materials to finished product than in farming.

In spite of such allowance, however, these examples serve to illustrate the large investment in property, especially in real estate, by farmers in proportion to the gross value of all production, as compared with other industries. An industry that approximates farming in this respect is the mining industry and the tax burden carried by mining consumes approximately as large a share of income as in the case of agriculture.

Since farming, of necessity, uses a relatively large amount of real estate it follows quite logically that relief from excessive tax burdens for agriculture must come in the direction of a keener recognition of other types of incomes as sources of more taxes and through a gradual shifting of some of the burden now carried by real estate to other sources of income.

[2] Census of Manufactures.

[3] Pennsylvania Dept. of Agr., Gen. Bull. 437, p. 63.

## Unequal Burdens

While the tax laws in Pennsylvania, where the writer has carried on most of his tax studies, differ from those of other states, especially in that Pennsylvania has no general property tax for state purposes, it is true, however, in most portions of the United States, as it is in Pennsylvania, that the large bulk of the taxes which farmers pay goes to maintain schools, roads and local government in his own country.[4] The farmer's tax problem is, therefore, peculiarly a local one but in spite of that fact one which does not admit of local solution.

Studies conducted during 1925 and 1926 show that in some townships in Pennsylvania taxes for local schools and roads equal the entire earning capacity of all the real estate in those townships.[5] A deed to an average farm in those townships, therefore, has no income value to the owner and the price paid for the farm simply represents a bonus or a bounty paid for the privilege of working on that farm at the wages of an average hired man in that community.

One must not assume, however, that since the taxes paid are for local purposes entirely and levied by the local people themselves, they must be ethical. A study of farm families in Tioga County, Pennsylvania, where marginal conditions are quite prevalent, although far from general, shows that 60 per cent of the children educated in the rural schools of the county leave the county upon or before reaching maturity. Since, with improved methods of farming and the more extensive use of farm machinery, as well as gas and electric power on farms, a constantly smaller proportion of the population is adequate to do the necessary farming, it

[4] 1924 Yearbook, U. S. Dept. of Agr., pp. 273–274.

[5] Pennsylvania Dept. of Agr., Gen. Bull. 437.

follows that the rural schools are constantly training more of the future leaders of the towns and cities, than the towns and cities train for the rural sections. The more densely settled centers of population, therefore, not only have a moral responsibility for the support of the rural schools, but they also have a selfish interest in the maintenance of schools of a high character in the rural sections.

A survey of the members of three leading service clubs in 14 Pennsylvania boroughs and cities shows that approximately 40 per cent of the leaders in the business and professional life of the town, who are members of service clubs, received their public school training in rural schools, while only 3½ per cent of them had given any service whatever to rural sections before going to town.

The responsibility of the state in equalizing the burden for the support of schools has been recognized for a number of years, and more recently in the case of roads and bridges. The distribution of state aid on a basis graduated inversely to the ratio of property values to the number of school teachers employed in a district is a recognition of this principle. In Pennsylvania, for example, districts which have less than $50,000 worth of taxable property for every school teacher in the district receive 75 per cent of the minimum salary required by law to be paid to school teachers. Those districts having between $50,000 and $100,000 worth of taxable property receive 60 per cent and those having over $100,000 worth, only 50 per cent of the minimum salary.

### STATE AND FEDERAL AID

While the evils of bureaucratic and over-centralized control, which frequently accompany state and federal aid, are fully recognized and even deplored, there seems to be no other workable method available at the present time for relief to over-taxed sections except to so develop the system of state and federal aid for both schools and roads that the burden remaining to be carried by the local people would consume about the same percentage of property incomes in all sections of the country.

Until this percentage is at the most no greater than the percentage of income required from those groups which pay most of the federal and state direct taxes, the rural sections are not receiving the amount of aid to which they are entitled.

Not only would state and federal aid to this extent be justifiable because of the interest which the states and the nation as a whole have in the character of training which children receive in the public schools and also in the maintenance of highways that permit of the development of the natural resources of the country, but also because very considerable portions of the taxable incomes in the large centers of population owe their true source to the industries located all over the United States and to the trade carried on with the people of the whole nation.

That "State Aid" has not been growing in any alarming fashion in recent years, as some would have us think, is indicated by a study of the amount of aid for schools extended by the state of Pennsylvania to 100 rural school districts. These districts were selected somewhat at random but so chosen as to guarantee the rural character of the districts selected. The current expenses for operating schools in these 100 townships had risen by 1926, to 425 per cent of the cost in 1900,[6] while state aid to these same districts was only 295 per cent of what they received in 1900. Local taxes for school purposes have,

[6] Changes in price level are disregarded in expenses, aid and taxes.

therefore, risen to 535 per cent of the 1900 levy since a larger and larger share of the expense had to be carried by local taxes. Not only is the state carrying a much smaller share of the current expenses now than in 1900, but there has been a constant lagging during the entire period. Most of these schools are operated on the basis of minimum standards laid down by the State Department of Public Instruction and the expenses, therefore, do not constitute any voluntary response on the part of the local school boards to over-enthusiastic interest in the schools by the local people.

Studies in New York State also show that state aid does not constitute a larger share of the local school funds than it did 40 years ago.[7]

The entire system of "Aid" from the Federal Government and from state governments should be based upon a thorough survey of the proportion of income consumed by taxes in all parts of the country and among all occupations of people. This aid should then be so distributed that, while a definite degree of responsibility and initiative be maintained among the local people, the amount of aid be so regulated as to equalize the ratio of local burden to incomes.

## SOME EXAMPLES

Studies conducted in a number of states indicate in some measure what such a survey would likely reveal. In some portions of the State of Pennsylvania as little as 15 per cent of the net income [8] from real estate is required to pay all taxes levied on the properties in those districts, while in other sections the average property tax is equal to the entire net returns from investment in farm real estate. (Net returns are returns above the costs of operation, including the value of the labor of the farmer and his family.)[9] For the state as a whole, 38 per cent of the net returns from investment in farm property is required to pay the taxes on farm real estate.

In Massachusetts, taxes on farms equalled from 11.16 to 37.76 per cent of the income from investment and from the operators labor and management in two different towns in 1921.[10] The average for four years was 9.58 per cent in one town, 13.47 in another and 16.39 in a third. If these operators are allowed wages at the rate of $68 per month, the prevailing farm wage rate in Massachusetts in 1922, as reported in "Weather, Crops and Markets" of the United States Department of Agriculture, the taxes amounted to an average of 28 per cent of the net returns from farms in one town and 87 per cent in another town.

In Arkansas, taxes on farms absorbed a range of from five per cent to more than 100 per cent of the net rent from farms in 1922.[11] For the state as a whole taxes absorbed 18.1 per cent of the net rent from farms.

In the lower peninsula of Michigan, taxes amounted to an average of 52 per cent of the net rents from farms during the seven years 1919–1925.[12] In Montcalm County, the average tax for the seven years was 33 per cent of the net rent and in Midland County 66 per cent.

In South Dakota, taxes in one entire county averaged 17.1 per cent of the net rent of farm land in 1926, while in

[7] Kendrick, M. Slade, Cornell Bulletin 457, p. 22, Dec., 1926.

[8] Net income is used to designate the returns to the landlord above repairs and insurance. On owner operated farms it represents the income above all expenses of operation including unpaid operator and family labor.

[9] "Some Phases of Taxation in Pennsylvania," Pennsylvania Dept. of Agr., Bul. 437.

[10] Massachusetts Exp. Sta. Bul. 235, p. 113.

[11] Arkansas Agr. Exp. Sta. Bul. 233, p. 7.

[12] Michigan Agr. Exp. Sta. Tech. Bul. 91, pp. 4 and 11.

another county in the same state taxes averaged 80.9 per cent of the net rent on farms.[13]

These illustrations serve not only as an indication of the lack of uniformity in the ratio of taxes to net returns from the same type of property in different sections, but also the excessively high tax burden resting on farm real estate in general throughout the country. When both farm and city real estate are considered, the lack of uniformity is even greater.

Not only does the tax on farm property constitute a very onerous burden, but compared with the taxes paid by other classes of people, it is excessive and unjust. Again we will resort to Pennsylvania figures to illustrate by conditions which exist in that state.

therefore, 13.6 in the case of the farmers and only 9.5 in the case of other citizens of the state. The ratio of taxes to wealth is, however, only slightly higher for farmers than for non-farmers, due to the large amount of capital invested by farmers in low income producing real estate.

The burden on the non-farm group is far from uniform. A discussion of this point has no direct bearing on the farmer's problem except in so far as it indicates where some of the additional revenue to be used for further support of rural schools and roads might come from. Because of the impossibility of allocating exactly the federal income tax by occupations and sources of income of those who pay it, exact figures on the tax burden of each group of

TAX BURDENS OF FARMERS AND OTHERS IN PENNSYLVANIA IN 1925 COMPARED WITH WEALTH AND INCOME *

| | Farmers | Non-farm | Farm in per Cent of Whole |
|---|---|---|---|
| Population | 910,847 | 8,565,153 | 9.62 |
| Wealth | $1,500,000,000 | $27,350,000,000 | 5.20 |
| Income | 265,954,000 | 6,952,046,000 | 3.68 |
| Taxes paid † | 36,090,200 | 651,763,000 | 5.25 |
| Per capita income | 292 | 812 | .... |
| Per capita tax | 39.62 | 76.10 | .... |
| Per cent of income for taxes | 13.60 | 9.50 | .... |

* Non-farm figures on wealth, income and taxes from National Industrial Conference Board.

† Includes all taxes for federal, state and local government except such sales taxes as automobile licenses and the tax on gasoline.

The per capita income of farm people is only 36 per cent of the average of all non-farm people in the state, but the per capita taxes paid by the farmers and their families are 52 per cent of the amount paid by the non-farm population. The percentage of income which goes to the support of all forms of government, federal, state and local, is,

[13] South Dakota Exp. Sta. Bul. 232, June, 1928, p. 30.

enterprises in the state cannot be given. Some unpublished data collected by Dr. Clyde L. King, while Secretary of the Commonwealth, in the previous administration, indicate that the ratio of total tax burden to income is about in the following order, with those listed last paying from three to five times as high a percentage of income in taxes as those heading the list. Construction, finance, general service, trade, manu-

facturing, transportation and public utilities, mining and agriculture. The groupings used are those employed in the census. The general service group includes all personal services, as well as restaurants and hotels. In this group personal incomes are no doubt responsible for a low average.

Similar compilations in other states would likely confirm the view that these figures are more or less typical of conditions throughout the whole country, not so much because any particular groups have conspired against the farmers to make them assume an unfair load but rather because farm incomes have gradually become a smaller and smaller share of the total national income as the industries of the country have developed. Farmers, however, have not been permitted to assume a corresponding smaller share of the national tax burden since this would involve legislation and economic adjustments which are slow in coming to pass. The enormous industrial development of the last decade or two did not bring with it a correspondingly larger development of non-farm real estate. Hence until the fact that real estate is a constantly smaller and smaller factor in the sources of income to American people is recognized by the legislators, and legislation enacted which will tax more heavily some of the incomes not derived from real estate and the tax revenues thus derived used to increase the support of the schools and roads now supported by local property taxes, farmers will continue to be handicapped by this unjust share of the total tax burden.

# Some Essentials of a Farm Relief Plan

By Hon. Arthur Capper
United States Senator from Kansas

IN discussing the essentials of a farm relief plan, it is not necessary to discuss the necessity for farm relief. That necessity is admitted on every hand. It does not have to be proved. The United States Chamber of Commerce, the National Industrial Conference Board, business leaders, economists, statesmen, and even politicians, admit the necessity. Also these admit the necessity for the solution of the farm problem to insure the future general prosperity of the country.

The fact that farm bankruptcies have increased more than 1,000 per cent during the past twenty years, while the percentage of commercial failures remains about the same as before, indicates how urgent the need is. In a recent address, Senator Brookhart pointed out that, while there is only two-thirds as much capital invested in manufacturing in the United States as in agriculture, and less than three-fourths as many factory workers as farm employes, yet manufacturing products reach an annual value of 44 billion dollars as compared with 12 billion dollars for agriculture.

## Six Essentials

To my mind there are at least six main essentials of a farm relief plan. By a successful farm relief plan is meant a plan which, in operation, will place agriculture on a basis where farmers will have an equal opportunity with those in other industries to make their business operations pay.

That is all agriculture is asking; all the farm organizations are asking; all that any farmer has any right to ask; all that any intelligent farmer is asking.

In considering plans for farm relief one should start from these two bases:

(1) *A depression that has become chronic exists in agriculture, creating the necessity for farm relief.*

(2) *All that agriculture is entitled to, and all that agriculture is asking, is that agriculture as an industry be placed in an economic position that gives the farmer an equal opportunity with those engaged in other industries to make his business pay.*

In discussing a plan for farm relief, cheaper production is not an essential factor that has to be considered at this time. The high price of labor and of all commodities the farmer has to buy is a part of his problem, but a noticeable reduction in labor costs is out of the question unless the entire nation goes on a lower standard of living. The farmer is not asking that, and does not want it. The readjustment of transportation costs which is a part of the farm relief program has more to do with the marketing of his products than with the production costs. The costs of the commodities he buys, in a general way, fall into a similar category.

Of the six essentials of a farm relief program that will place agriculture on the basis of equal opportunity, four deal directly with the problem of marketing.

These are, in my judgment:

1. A protected home market for farm products on an import or marginal basis, through higher tariffs on farm products without substantially higher tariffs on the commodities the farmer has to buy.

2. Protection equivalent to tariff protection—and aided by tariff protection—on major farm products on an export basis, where it is plainly impossible to reduce the acreage without bringing an overproduction in minor crops that would ruin the growers of these minor crops.

3. Decrease in the spread between producer and consumer—lessened marketing costs—through coöperative marketing, comparable to the chain store system of merchandising.

4. Decrease in the spread between producer and consumer—lessened marketing costs—by the reduction toward the point of elimination of the high annual toll the farmer pays for the market gamblers' orgies. I refer to speculation in grain futures.

There are two other essential features in any comprehensive and sound scheme of farm relief. These are:

5. Lowering of transportation costs.

6. Reduction of the unfair share of the taxation burden now borne by the land; this applies of course to the owners of city real estate as well as of farm land, but is particularly a farm land problem.

It is not intended in this brief article to go into any extended discussion of these six essentials. It is not claimed that these are all the essentials, but they are regarded as six of the most important essentials. As Herbert Hoover has declared, the farm problem is made up of a number of problems, each of which must be studied carefully and solved along sound economic lines if a workable and effective solution is to be reached.

Revision upward of the tariff on farm products is an essential part of any practicable farm relief plan.

The farmer's protection on what he sells should be equal to the protection on what he has to buy.

It is sophistry to proclaim that "Pass a special privilege around, and it is not a special privilege." Pass it to all the world, and the remark is true. But inside this country, if industry and labor and commerce and finance and manufacturing are to have a protected market, agriculture can have a protected market also without destroying the general prosperity that goes with the American standard of living. It will only share in the general prosperity, and agriculture is entitled to that.

The tariff protection on agricultural products is not adequate. Last year we collected duties on two billion dollars' worth of farm products—and that does not include farm products on the free list.

Farm products still have less than 90 per cent of their pre-war purchasing power. During eight years they have averaged less than 85 per cent. Agriculture trades with manufacturing, labor, commerce, finance, at a 15 per cent annual loss. Until 1920 agriculture never received less than 20 per cent of the annual national income. In eight years it never has received as much as 12 per cent; much of the time 10 per cent, or even less. Those two statements constitute the farm problem, stated in one paragraph.

The tariffs on farm products should be revised upward before any general revision is attempted. It will be a farce to start from the present relationship, and revise agriculture and everything else upward. That will be more than a farce; it will be a ghastly joke, a tragedy.

Higher tariffs will take care, largely, of farm products on an import and marginal import basis.

But higher tariffs will solve only partly the problem for farm products on an export basis, such as wheat. The tariff maintains a parity or better between the Winnipeg and Minneapolis markets. But the Kansas City

wheat market is consistently, constantly, seven or eight cents below the Winnipeg market. The transportation charge helps account for that. It will be discussed later.

So that for exportable surpluses of farm products more protection than that afforded by the tariff alone must be provided.

Government aid for coöperative farm marketing will be of material assistance in this line. It will promote orderly marketing, smooth out the "humps" and "hollows" in the marketing curve which costs the wheat growers and cotton growers millions of dollars annually.

### HELP PROMISED

The machinery recommended by Herbert Hoover promises help in this direction, and as I read the farm relief measure introduced this session by Senator McNary, it follows closely the program laid down by Herbert Hoover in his St. Louis speech the week preceding the November election.

Whether that is sufficient remains to be seen. The solution calls for an effective brake on greater over-production. The equalization fee of the old McNary-Haugen bills attempted to supply this brake. The fee is out of the picture for the present. It is to be hoped that it will not be necessary. But the orderly marketing program will have to be supplemented by that brake, or we are in danger of encouraging overproduction.

Government aid for orderly marketing through encouraging with information, advice, and financial advances the coöperative marketing movement also will help to decrease the spread between producer and consumer. That spread is too great. The producer gets 30 cents out of the consumer's 100 cents. Coöperative marketing, selling policies along the lines of the chain stores, will cut the spread somewhat.

But speculating in futures by the market gamblers causes a big proportion of the unnecessary spread. There is a legitimate hedging on the futures market that is justified, and must be maintained. But there is no economic excuse for the gambling in foodstuffs that cuts into the legitimate profits of the producer and adds the gamblers' "divvy" to the prices paid by the consumer.

Flooding the board of trade with millions and millions of bushels of "paper" wheat depresses the producers selling market just as much as if there actually were that much added to the supply of wheat.

Then after the wheat passes out of the producers hands, a similar fictitious "paper" demand for wheat is created by the wheat gamblers, and the consumers' buying market is affected just the same as if there were an actual demand in excess of the supply, when as a matter of fact there is a surplus, so far as the domestic market is concerned.

It is time that gamblers should be eliminated from the market, and futures operations be limited strictly to legitimate hedging transactions. This is exactly what I hope to do in a bill now before Congress, Senate 3575. It declares that unbridled "short" selling and "long" buying are against the public interest, and endeavors to restrict such practices to the ordinary commercial needs of legitimate hedging.

The problem of transportation costs is a complicated one, too complicated to be more than touched upon in a general article. But an example can be cited. Wheat is Kansas' principal cash crop. Kansas produces about 150 million bushels a year, on an average. It costs 41 cents to ship a bushel of wheat from the center of the Kansas

wheat belt to the world market of Western Europe, say Liverpool. It costs only 31 cents from the center of the Canadian wheat belt for the same distance.

Roughly, the producer gets the world price less transportation—and certain handling charges that are about the same on Kansas and Canadian wheat—costs for his wheat. Not just on what actually goes to Western Europe, but on his entire crop. So that difference of ten cents a hundred pounds, as reflected in the difference in the Winnipeg and Kansas City markets, is applied to every bushel of wheat sold from Kansas farms, whether it goes to Liverpool or to the nearest mill. Apply that dime a hundred pounds to 150 million bushels of wheat, and you have the Kansas interest in reduced freight rates on grain.

Freight rates must come down, just as the tariff rates must go up. Both are essentials of the farm relief program.

Taxation, as an essential of the farm relief program, is up to local, rather than to the national, government for solution. The general property tax places too heavy a burden on the land, in this day and generation. The state legislatures are wrestling with the program. Income taxes, inheritance taxes, sales taxes on luxuries and non-essentials—these are some of the remedies that are being applied, and will be applied more generally and generously in the future.

Our taxation burden is heavy enough, even if evenly distributed. But it would be lightened immeasurably for agriculture if all classes and all persons were allowed to contribute their fair share toward the staggering cost of government.

It goes without saying that any reductions in the cost of government would be reflected in better conditions for agriculture, and every effort should be bent toward that end. But governmental costs are not going to be reduced materially. That they may be more equitably distributed is about the best that can be hoped for.

The foregoing are not all the essentials of a farm relief program. But they are essentials which, in my judgment, will go a long way toward relieving a grievous situation that threatens agriculture, in which nearly one-third of our population is engaged, and on which more than one-half of our population depends for a livelihood.

# The Essentials In Farm Relief As Viewed By The American Farm Bureau Federation

By Sam H. Thompson
President, American Farm Bureau Federation

JUST ten years ago, in February, 1919, the original organization meeting from which the American Farm Bureau Federation developed, was held at Cornell University, in Ithaca, New York. At the gathering and in a subsequent meeting in Chicago, the deliberations resulted in the following formulation of the objects of the Federation:

The objects of the American Farm Bureau Federation are to develop, strengthen and correlate the work of the State Farm Bureau Federations of the nation; to encourage and promote coöperation of all representative agricultural organizations in every effort to improve facilities and conditions for the economic and efficient production, conservation, marketing, transportation, and distribution of farm products; to further the study and enactment of constructive agricultural legislation; to advise with representatives of the public agricultural institutions coöperating with Farm Bureaus in the determination of nation-wide policies, and to inform Farm Bureau members regarding all movements that affect their interests.

The progress that has been made in carrying out those policies since the national organization was effected, is now a matter of history. Those objects stood out prominently as the greatest needs for the farming industry at that time in the opinion of that convention. Time has proven that they were not mistaken, and that the need for agriculture today is in line with the constructive program offered at that time.

I would here pay sincere tribute to those men of vision who saw the need of agriculture and met it by designing an organization fashioned to meet the peculiar problems of the industry.

What has been accomplished is of the past and our duty now is to discover the problems that face agriculture today and to direct our energies to meet those problems.

Of recent months much has been said about the agricultural situation and there has been much speculation as to just what are the difficulties confronting the farmers.

In a journal of this type I do not believe it is necessary to review the great mass of statistics which have been forthcoming on the subject. Late last fall they were summarized by the National Industrial Conference Board in a report which declared that "the agricultural situation has shown no fundamental improvement during the past six years," and that "current indications warrant no expectation of such a change in the near future."

Economists, I am sure, are familiar with this convincing evidence which has led to the generally accepted conclusion that our present system of distributing agricultural commodities is wasteful and costly, and that, as a result, the farmer has not been receiving a fair share of the consumer's dollar.

In the opinion of the American Farm Bureau Federation responsibility for much of the inequality that now exists is due to the lack of organization, which would make possible pro-

ducer-control of the sale and distribution of farm commodities.

The most difficult problems now confronting the American farmer center around the marketing and distribution of the products of his labor. It is on this point that the principle discussion of the past seven years has centered.

To my mind the most heartening thing that has come out of the turmoil was Herbert Hoover's declaration in a speech at St. Louis, just prior to the November election, when he acknowledged that the agricultural problem is, as he stated it,

> the most urgent economic problem in our nation today. It must be solved if we are to bring equality of opportunity and assurance of complete stability to all of our people.

It is well known that the American Farm Bureau Federation has sponsored and supported measures that we sincerely felt would make the American policy of protection effective for agriculture but now, with Mr. Hoover's administration offering a broad program that will give agriculture just the benefits we seek and will place the farmer on an equality with those other groups, we have deemed it wisdom on our part to hold ourselves in readiness to consider on their merits such measures as will be advanced from time to time and that we should allow opportunity for the best minds in America to study this program.

If after mature thought and deliberation, a better way is found that will do this job, then we shall support the better way and see that it is enacted into law. This is of such vital importance to the welfare of thirty million farm people first, and to the nation as a whole, that the way it is accomplished is insignificant in comparison to the importance of having it done well and effectively.

## THE NEED FOR BARGAINING POWER

Organization will play a constantly increasing part in the future operations of the farming industry. The Farm Bureau is teaching its members how to use this powerful agency to help them with the problems that confront the individual farmer almost every day, and is enabling him to overcome many of the obstacles that he as an individual would be helpless to combat alone.

Farmers of the future will, of necessity, be good business men; in fact, our successful farmers are those who have learned by business practice all about their own business and are progressive enough to adopt such a system of farm accounting that it enables them to know just where the weakness lies, and having discovered it, take the necessary steps to overcome the difficulty. This experience has been bringing the individual in closer touch with his Farm Bureau and also with the Department of Agriculture, Extension Workers and Agricultural Schools, all of whom have made available for him the necessary information.

We will always have the individual farm unit where the farmer and his family reside on the farm. This is as it should be. It has been one of America's greatest assets. It has had a very helpful and stabilizing influence in American life. It should be made so secure that we will constantly have men and women of the highest character and intelligence going out of these farm homes to fill the responsible positions in every walk of life.

But while I believe we will always have the individual unit ownership and individual farm home, I am not contending that we shall always have individual unit production—nor that we should have.

The basic thing that American

agriculture must have is bargaining power, the ability to meet on an equality those with whom they wish to exchange goods.

In the olden days farm people had bargaining power in a simple form. The farmer raised his corn, his apples, or whatever his crop was. When he wanted a pair of boots he took so many units of his crop and went to his trading center. There he found the cobbler and bargained directly for a pair of boots.

Now the farmer, when he wants a pair of boots, must exchange his commodity into money—the medium of exchange. If the purchasing power of his dollar is not as great as that of the boot maker the farmer is at a disadvantage.

Several factors enter into that simple picture. We farmers are still farming our individual unit as we were in the direct bargaining days. We are doing it much more efficiently—but still the same unit. The boot maker, on the other hand, has found that he can fare better by combining with many hundreds of other boot makers into a shoe factory. So that when we go to buy a pair of boots we are not only dealing with a highly-centralized marketing agency, but we are dealing with a centralized producing unit.

It may well be that agriculture must go another step in coöperative effort and adopt coöperative production. It was with the end in view of learning the possibilities inherent in the idea of applying group effort to the production of farm crops that at the national convention of the Farm Bureau last December, delegates instructed me, as their president, to appoint a committee for study of this subject of coöperative production whereby we expect to develop some interesting information.

Certainly no marketing system that we may set up can compete in the market place unless the commodity handled through the system is produced as economically as the commodities with which our farm commodities compete are produced.

## EFFICIENT MARKETING THROUGH COÖPERATION

Sound production and marketing must be the basis of our program. These can be obtained through group action based on research and the wide distribution of information. Like any other industry faced with problems of surplus production, wasteful practices, faulty distribution systems, too high transportation costs, too great a tax burden—we must provide research facilities through which to secure the real facts. And then provide the organization to carry into effect plans to remedy the situation.

The Farm Bureau, through its national office, its state offices, its 1,800 county organizations, and the 15,000 organized community units provides the machine which we feel can accomplish the desired end. Studies conducted during 1928 show that the services provided by the Farm Bureau give the farmer control of 92 per cent of the factors affecting production; and 87½ per cent of the factors affecting marketing.

The present condition within our industry demands such efficient production that a farm accounting system is insistently required. This system would put farming on a business basis and would force the farmer to conduct his operations in such a way as to protect the capital invested.

This will require the elimination of waste and the most careful thought on the part of the individual himself, with the responsibility resting on him of knowing more about his business and instituting the best business practice

in the operation of the farm. It will make him realize that no matter how efficient he is, every operation has a very material effect on his balance sheet at the end of the year.

Many of the farmer's problems such as taxes, transportation and the marketing of his crops, are beyond individual control. He is just learning the value of organization which will play a much more important part in the success of the individual farmer in the future.

We have seen that the present method of distribution and marketing of farm crops has not resulted in the farmer getting an increased share of the consumer's dollar, nor can this be overcome by the individual farmer himself. It can only be remedied through coöperative effort.

Some progress has been made during the last few years by the different commodity groups through their own selling agencies and these have achieved a degree of success in being able to render a saving to the producer while retaining a larger part of the consumer's dollar. The Department of Agriculture in a late report shows that last year two billion five hundred million dollars' worth of farm produce was marketed coöperatively. We believe that coöperative marketing is sound in principle and practical in operation and should be extended as rapidly as the demands justify the setting up of such agencies.

## NEEDED: A NATIONAL FARM POLICY

Efficient production and coöperative marketing alone will not be able to effect all that is necessary to put agriculture on a sound basis. If we are to expect agriculture to attain the standard of living now achieved elsewhere in America, the nation must deal with agriculture as it has dealt with industry, labor, finance and transportation. Organization and efficiency alone could not have attained the standard of living those other groups enjoy. Efficiency and organization alone cannot attain for American agriculture that which has been achieved and accepted as the greatest achievement in America progress.

If we are to find the remedy, we must look farther. We must secure a permanent national policy that will bring agriculture within the accepted American protective system, to the extent that protection is extended to the products of the farm just as effectively as it has been extended to the other groups that go to make up our national life.

That this program be made effective the American Farm Bureau Federation proposes to direct the energies of our entire organization along several specific channels. Early in 1925, Congress passed the Hoch-Smith Resolution, which declares that, in view of the existing depression in agriculture, the Interstate Commerce Commission is directed to effect with the least practicable delay such changes in the freight rate structure of the country as will promote the freedom of movement by common carriers of the products of agriculture, including live stock, at the lowest possible rates compatible with the maintenance of adequate transportation service. At the end of 1928, we had secured some satisfactory adjustments in line with the Hoch-Smith Resolution. However, during the year we plan to push to completion the important cases that have been opened as a result of this resolution, thus assuring fair freight rates on all agricultural commodities.

To further facilitate the transportation of farm commodities, our influence is being directed to the speedy completion of an adequate system of inland

waterways. Further extension of farm to market highways is also being sought.

In taxation the work already initiated by many of our states will be encouraged and, wherever possible, made more effective. Through efforts of the national organization we hope to inaugurate in every state where farm taxation is unduly burdensome, an effective campaign for the equalization of taxes, based on the principle that taxes should be borne by all in proportion to their ability to pay.

To this end I was authorized by our recent national assembly to call a representative conference of state Farm Bureau leaders, for the specific purpose of correlating the tax programs of our various state organization units covering both state and local government, and to formulate a unified project in these matters.

Further development of coöperative marketing is necessary. The Farm Bureau has always advocated this system of marketing. We are now prepared to join with coöperative associations in supplying economic, legal, transportation and other services, which will be of substantial value to them and will provide a unified service that these organizations, acting independently, would be at a disadvantage in trying to provide for themselves.

Full support of efforts to devise through scientific research new and economic uses for agricultural products will be supported by the Farm Bureau.

That local communities may effectively work out problems of production, marketing and questions of local civic importance, we are continuing our efforts to establish community organizations in every county Farm Bureau in the country. The service of our Department of Information is being extended to reach every farm family belonging to the organization, to the end that reliable, definite information can be regularly placed in the hands of our membership.

Above all, we recognize that in order to make this program effective, agriculture must be further organized and that the business of securing membership is of first importance. Until a majority of the farm people of this country can be brought to think and act in unison, we realize that satisfactory progress cannot be made. We intend therefore to invite every progressive farmer and farm woman in this country, to become members of the organization, in order that our program for the improvement of the condition of agriculture may be speedily accomplished.

In brief, that is the broad outline of the program by which the organized agriculture of America must meet the present situation within the industry.

## THE GOAL

And to what end do we develop this program? A task calling for so great self sacrifice, for so much heart-breaking toil and work must have a worthy goal. What is the goal, the ultimate aim of this program?

I know no better way to express that goal than to use the words of a great Farm Bureau leader who a few years ago said: "The whole purpose of the Farm Bureau is to make possible a happy, contented home on every farm in America."

Our program centers in the farm home—the place where children are born, where boys and girls grow to manhood and womanhood, where nature weaves God's handiwork into the life and character of the folks reared in the rural home. In our struggle for economic equality for agriculture, it has been charged that we are losing sight of the deeper things in life and the spiritual values that tend to make

life richer and fuller. Nothing could be farther from the truth.

The American Farm Bureau in all of its activities, and particularly through the work of the Home and Community department, constantly supports and fosters institutions and movements designed to improve the religious, cultural and moral background of our farm homes.

But we recognize that practically the desire for higher life for the farm family must rest on the firm foundation of a sound economic condition for that family.

The ultimate goal, then, of our organized effort is a higher standard of living for the farm family made possible through an increased farm income.

An analysis of the present situation shows that not more than eight hundred thousand farms in this country are being operated today at a profit; eight hundred thousand out of six and a half million.

Full realization of the program of the Farm Bureau will mean that four and a half million or 80 per cent will be operating at a profit; four million farm people today enjoying an adequate standard of living as compared with twenty-two million who will enjoy that standard as a result of the successful development of the program I have outlined.

Agriculture, through organized effort can add from four to five billion dollars to its annual income. An impressive sum. Translated in terms of individual farm families it would add a total net income of seven hundred and fifty dollars a year for every family now living on a farm in the United States.

What does $750 mean? A new car, a bathroom and a furnace, installation of electricity and new clothing for the entire family, a new tractor, a college education for John or Mary, the clearance of a mortgage, better food, proper medical attention—those are a few of the things that could and would be bought each year by eighty per cent of the farm families with the $750 increase in income—bought in addition to what they are now buying.

We do not need many more figures to show that the goal of their program is worth the effort and the toil that must come before realization. It is hardly necessary to point out that this increased income would increase the value of farm lands. Nor is it necessary to emphasize the fact that the increased earnings would hold on the farm many of the brighter, more alert young men and women who today are leaving the farm for the greater return offered by industry and commerce.

To farm people the development of the Farm Bureau program will mean a new standard of living; it will mean happy and contented homes on a majority of our farms. But how will it affect our city and town population? While it is true that about a third of our people live on farms and that agriculture is a basic industry, still agriculture cannot build its welfare at the expense of others. Any successful program for organized agriculture must take into consideration the rights and welfare of all the people in the United States.

The program of the Farm Bureau offers this to those outside of agriculture:

First. A tremendous new and expanding market for manufactured products that will vastly stimulate commerce. In many lines the urban market can be expanded but little farther. To these the farm market offers a new and greater opportunity. This expanding farm market will offer greater opportunity for labor. It will do away with unemployment

and make for a greater national prosperity.

Second. Less labor competition. Increased farm income will stop the huge flow of men and women from the farm to the city, thus cutting down the labor competition and the unemployment created by this annual army of recruits to the industrial world.

Third. Lower food and clothing costs. It is sometimes contended that the program to increase farm income would in a like measure increase food costs to the ultimate consumer. I do not believe this to be true.

In the steel industry we have an example of a business which through organization has eliminated wasteful production and distribution practices and by so doing tremendously expanded and increased its income and profit while at the same time it has lowered its costs per unit to the consumer.

I believe something like that would follow the development of the Farm Bureau program for agriculture. Wasteful, inefficient methods in the production and distribution of farm products would be eliminated, new markets would be developed, agriculture would enjoy a greater proportion of the consumer's dollar while the consumer would get more for that dollar.

This, I believe, is a true picture of what the development of this program would mean. Leadership in this great work must be equal to the demand, and then the people will follow gladly. Happily the American Farm Bureau is non-sectarian, non-political, non-sectional, and it represents all phases of the agricultural industry. This permits our free coöperation with all other farm groups and all institutions working for the good of agriculture. We have always expressed a sincere willingness to establish cordial relations with other farm organizations.

The American people have the greatest heritage of any people on the earth, both spiritual and material. It is the most valuable that has come to any nation. The challenge is to constructive farm leaders who must wholeheartedly unite their efforts and hold them sacred for the generations that are to follow, so that spiritual forces may grow stronger and the material blessings may be dispensed in the spirit of fairness that will bring economic justice to all mankind.

# The Attitude of the National Grange Toward the Tariff[1]

By L. J. Taber
Master, National Grange

As the representative of the National Grange, it is a privilege to speak for its 800,000 members, scattered in thirty-three states and distributed in 8,000 local or subordinate branches. As our organization is national in character, we must view all problems from a national rather than sectional or local viewpoint. The conclusions of this brief are of necessity tempered with the readjustments and interests of our entire membership.

## Agricultural Legislation

Our organization has a consistent and persistent record relative to legislation for the protection of agriculture. Sixty-two years ago the struggle was begun in an organized way to give equality to the farmer. Forty years ago the Grange enunciated its tariff policy with the slogan, "Tariff for all or tariff for none." We have sought to gain for agriculture tariff protection comparable with that enjoyed by industry. The logical development of this program is that the American farmer is entitled to sufficient protection to give him the American market.

Our tariff philosophy is based on the belief that in every case the American farmer is entitled to tariff protection equal to the difference of cost of production at home and abroad and sufficient profit to allow him to maintain the American standard of living upon the American farm. Recently our organization has favored a broader interpretation of the tariff policy than has yet been recognized, or rather, we go back to the conception of the tariff enunciated by Alexander Hamilton, that the purpose of the tariff was for the benefit of agriculture as well as industry, rather than the raising of revenue. We have insisted that the principle of the drawback and the principle of the remitted tariff duties, written in recent tariff laws, should be extended to agriculture in the form of the export debenture idea, which would give tariff protection to the export branches of our agriculture and is the logical complement of a complete tariff structure.

In writing tariff legislation the ultimate consumer must be considered, and in this regard we point out that the farmer is a consumer and that practically every agricultural item represents a product consumed by farmers themselves in some section of the nation. For example, more farmers buy corn than sell corn. Ninety per cent of our farmers use citrus fruits, less than 10 per cent produce them. Ninety-five per cent of our farmers use grass seed and hardly more than 5 per cent are engaged in its production. Therefore, agriculture must take a fair consumer viewpoint on all problems of tariff adjustment.

The consumer will be better protected in the United States when we have an abundant, reasonably-priced and domestically-produced food supply. This can best be brought about by the program of adequate tariff protection. Allow foreign competition to destroy the American producer and we find ourselves at the mercy of a foreign monopoly that is not amenable to the laws of the United States. Stimulate foreign production and then in case of

[1] Tariff brief of the National Grange relative to Schedule 7, Agricultural Products and Provisions, paragraphs 701–780, incl. Submitted to House Ways and Means Committee, January 28, 1929.

war or the dislocation of ocean transportation we would find the consumer penalized by unheard of prices like sugar prices during the war. Should we become dependent for our meat supply on foreign sources, and then should foot and mouth disease now raging in Argentina and much of Europe suddenly become prevalent, making it necessary to apply an embargo on our foreign sources of meat, prices would reach unprecedented levels. It would take years to restock the ranges with cattle and again fill the feed lots.

It is a better program, and a policy more in accord with wise national statesmanship to give the American farmer the American market for products that can be domestically produced. Monopolistic or corporate control will be impossible with 6,500,000 producers. Sectional and individual competition will be the consumer's protection against high prices. Farm efficiency has kept pace with industrial efficiency. Give the farmer a square deal, give him a fair share of the consumer's dollar, and from the farms of America will come the necessary food and fiber to clothe at least 250 million people, at a price not disproportionate to the price level of other commodities.

## TARIFF POLICY

The protection of agriculture demands a policy that goes a step further than simply giving protection to those commodities produced in the United States because modern science, the development of chemistry, the skill of the manufacturer and processor are such that it is possible to provide substitutes and imitations for most of our farm products now on the market. For example, cocoanut oil is not only in direct competition with oil-bearing seeds grown in this country but is in a certain degree a competitor with vegetable and animal fats. At the same time it is used as the base for substitutes for butter. What is true relative to cocoanut oil and the dairy industry is in a smaller degree true of bananas and similar tropical fruit in relation to home-grown fruits.

When we insist upon a well-rounded, well-balanced tariff policy for American agriculture, we are only asking equivalent protection for a basic industry that is enjoyed by other industries, and we are also asking for a program that will diversify agriculture, broaden our home production and reduce the pressure on crops that are now producing burdensome surpluses. It would be a wise policy to increase the tariff on flaxseed, for example, not only to enable the American farmer to produce the flax needs of the nation, but it would at the same time withdraw three or four million acres from wheat production and reduce the pressure on this surplus crop.

In most cases we believe there would be greater protection by specific rates rather than *ad valorem* rates, because specific rates will have a general stabilizing effect. In the case of commodities subject to wide fluctuation in price, however, there should be minimum *ad valorem* rates in addition to specific rates. This will have the effect of stabilizing and protecting both producer and consumer.

The farmers of the nation are in favor of tariff adjustment in Schedule 7 as well as the other schedules that affect their industry and are not seeking to interfere with tariff protection where justified and enjoyed by other groups, but we do insist that the need of the farmer is that tariff legislation may be rewritten bringing agriculture fully up to the protection enjoyed by other groups.

The testimony before the Committee as submitted by *bona fide* commodity groups has been so clear and well presented that it would seem an undue

repetition to file all the material that our organization has collected. Consequently, in our discussion of the various schedules and in our suggested rates, we shall refer to the briefs of producers' organizations and indorse rather than duplicate their testimony or repeat arguments already in the record.

### NEED OF READJUSTMENT

The imperative need of readjustment of the agricultural schedules is forced upon us by a study of the staggering volume of imports of agricultural products. Today the imports of agricultural products practically equal our agricultural exports. According to the 1927 Yearbook of the United States Department of Agriculture, the imports of agricultural products, excluding rubber and forest products totalled $1,906,150,000 during 1927. Our agricultural exports for the same period amounted to $1,907,851,000. Dutiable agricultural imports for 1927 amounted to approximately $650,000,000, as compared with free agricultural imports amounting to approximately $1,250,000,000. The real surplus that is distressing American agriculture is imported into the United States from countries with lower standards of living and lower costs than exist here. As long as we have competitive imports of the enormous total of two billion dollars, the necessity for revision upwards of the agricultural schedules will be apparent.

The statement in the party platforms and the platform and public utterances of the majority of candidates for House and Senate gave the assurance that agriculture was entitled to the same protection that industry now receives. Acting upon this assumption, we have made a study of many industrial schedules, and we are led to believe that 40 per cent *ad valorem* is about the average duty. In cutlery, in aluminum ware and many other commodities that the farmer must buy, the *ad valorem* rate is much higher than 40 per cent. Some manufactured articles fall below 40 per cent. The average *ad valorem* rate of duty enjoyed by agricultural products and provisions during 1927 was 22.54 per cent.

The Statistical Abstract of the United States for 1928, compiled by the Department of Commerce, shows average *ad valorem* duties on six schedules of the Tariff Act as follows:

| SCHEDULE, 1927 | Per Cent *ad valorem* * |
|---|---|
| Chemicals, oils and paints | 28.48 |
| Earths, earthenware and glassware | 48.43 |
| Metals, and manufactures of | 34.84 |
| Silks and silk goods | 56.18 |
| Sundries | 39.19 |
| Cotton manufactures | 35.99 |
| Average duty on above six schedules | 40.52 |
| Average duty on imported agricultural products, excluding free list | 22.54 |

* (Or average *ad valorem* rate of duty to values of dutiable merchandise.)

Conceiving that a comparative study of present rates with a 40 per cent *ad valorem* tariff would show the inadequacy of present agricultural tariffs and also the fairness of the contentions of the farmer, we requested the Bureau of Agricultural Economics of the United States Department of Agriculture to make a study along the lines above indicated. After careful study, the Department has prepared an extended table carrying out this idea, which is both interesting and instructive. We are taking a few typical cases and are attaching a short chart giving this comparison. We are perfectly sensible of the fact that a uniform rate of 40 per cent *ad valorem* would not work out satisfactorily in all cases. There are certain agricultural commodities which require a higher rate of duty than 40 per cent, just as there are manufactured

| Year | Unit | Imports for Consumption | | Average Unit Import Value | Present Rate Duty | Equivalent *ad valorem* | Specified Duty Computed to Equal 40 per Cent *ad valorem* | National Grange Suggested Duty |
|---|---|---|---|---|---|---|---|---|
| | | Quantity | Value | | | | | |
| **PARAGRAPH 702—SHEEP** | | | | | | | | |
| Av. 1925–7 | number | 45,933 | $339,657 | $7.395 | | | $2.958 | $3.00 |
| 1925 | " | 67,054 | 497,780 | 7.42 | $2.00 | 26.94 | | |
| 1926 | " | 42,146 | 296,398 | 7.03 | 2.00 | 28.44 | | |
| 1927 | " | 28,598 | 224,792 | 7.86 | 2.00 | 25.44 | | |
| **PARAGRAPH 703—SWINE** | | | | | | | | |
| Av. 1925–7 | lbs. | 23,778,238 | $2,729,055 | .115 | ½¢ | | .046 | .03 |
| 1925 | " | 17,520,029 | 1,964,825 | .1122 | ½¢ | 4.46 | | |
| 1926 | " | 17,930,865 | 2,181,188 | .1216 | ½¢ | 4.11 | | |
| 1927 | " | 35,883,850 | 4,041,153 | .1126 | ½¢ | 4.44 | | |
| **PARAGRAPH 709—BUTTER** | | | | | | | | |
| Av. 1925–7 | lbs. | 7,348,296 | $2,605,261 | .35 | 8–12¢ | | .1418* | .15 |
| 1925 | " | 6,861,435 | 2,553,219 | .3722 | 8¢ | 21.5 | | |
| 1926 | " | 3,276,024 | 1,156,381 | .353 | 8¢ | 22.66 | | |
| 1927 | " | 3,451,031 | 1,233,006 | .3573 | 12¢ | 33.59 | | |
| 1927 | " | 8,456,397 | 2,873,177 | .3398 | 12¢ | 35.32 | | |
| **PARAGRAPH 712—POULTRY, DEAD** | | | | | | | | |
| Av. 1925–7 | lbs. | 4,104,539 | $1,287,534 | .314 | | | .126 | .10 |
| 1925 | " | 2,799,784 | 865,036 | .3090 | 6¢ | 19.42 | | |
| 1926 | " | 5,946,591 | 2,003,322 | .3369 | 6¢ | 17.81 | | |
| 1927 | " | 3,567,242 | 994,245 | .2787 | 6¢ | 21.53 | | |
| **PARAGRAPH 724—CORN** | | | | | | | | |
| Av. 1925–7 | bus. | 2,365,234 | $2,012,962 | .851 | 15¢ | | .34 | .30 |
| 1925 | " | 1,123,193 | 1,223,276 | 1.09 | 15¢ | 13.77 | | |
| 1926 | " | 1,055,895 | 908,911 | .86 | 15¢ | 17.43 | | |
| 1927 | " | 4,916,615 | 3,906,699 | .79 | 15¢ | 18.88 | | |
| **PARAGRAPH 729—WHEAT** | | | | | | | | |
| Av. 1925–7 | bus. | 593,576 | $789,811 | 1.33 | | | .53 | .42 |
| 1925 | " | 1,308,399 | 1,701,851 | 1.30 | 42¢ | 32.99 | | |
| 1926 | " | 451,029 | 640,140 | 1.42 | 42¢ | 29.59 | | |
| 1927 | " | 21,299 | 27,443 | 1.29 | 42¢ | 32.60 | | |
| **PARAGRAPH 743—ORANGES** | | | | | | | | |
| Av. 1925–7 | lbs. | 1,113,586 | $59,884 | .054 | | | .022 | .02 |
| 1925 | " | 1,033,179 | 51,433 | .050 | 1¢ | 20.00 | | |
| 1926 | " | 854,811 | 47,161 | .055 | 1¢ | 18.13 | | |
| 1927 | " | 1,452,768 | 81,059 | .056 | 1¢ | 17.92 | | |
| **PARAGRAPH 760—FLAXSEED** | | | | | | | | |
| Av. 1925–7 | bus. | 20,278,140 | $39,679,867 | 1.957 | | | .783 | .84 |
| 1925 | " | 16,509,686 | 39,682,722 | 2.40 | 40¢ | 16.64 | | |
| 1926 | " | 22,316,372 | 40,940,619 | 1.835 | 40¢ | 21.80 | | |
| 1927 | " | 22,008,363 | 38,416,260 | 1.745 | 40¢ | 22.92 | | |
| **PARAGRAPH 767—PEAS, GREEN** | | | | | | | | |
| Av. 1925–7 | lbs. | 6,473,984 | $316,306 | .042 | | | .017 | .02 |
| 1925 | " | 3,919,512 | 117,524 | .03 | 1¢ | 33.35 | | |
| 1926 | " | 9,280,683 | 378,545 | .0408 | 1¢ | 24.52 | | |
| 1927 | " | 9,221,757 | 452,850 | .0491 | 1¢ | 20.36 | | |
| **PARAGRAPH 769—POTATOES** | | | | | | | | |
| Av. 1925–7 | lbs. | 257,620,343 | 5,393,245 | .021 | | | .008 | .01 |
| 1925 | " | 133,382,063 | 2,943,121 | .0221 | ½¢ | 22.66 | | |
| 1926 | " | 338,824,182 | 8,221,038 | .0243 | ½¢ | 20.61 | | |
| 1927 | " | 300,654,785 | 5,015,576 | .0167 | ½¢ | 29.97 | | |

* Two-year average, 1925–6.

articles that require a higher rate than the figure named. In a supplementary brief we intend to file all this material for the information of the Committee. This study will show that the rates requested will be below 40 per cent on many commodities, and will also demonstrate that organized agriculture has been conservative in its requests for tariff readjustment.

We have briefly summarized the various items and paragraphs in order to clearly emphasize our position in regard to rates, cost of production and other matters. In the following material we want to make it clear that we are speaking not only for the national organization, but in practically every case with definite instructions from the State Granges in question where the commodity is produced.

## CONCLUSION

Organized agriculture is neither selfish nor unfair. The Grange, along with other farm organizations, has an earnest desire that all other groups shall prosper, but in the name of our organization we solemnly insist that the fifty years' fight of the American farmer for equal tariff opportunities shall now be written into law.

We appreciate to the fullest the complexity of the problems that present themselves in connection with the revision of our tariff law. It is a stupendous task which rests upon this Committee and Congress as a whole. The interests of producers and consumers and our relationship with other nations must always be kept in mind.

The fact that the value of the securities of many manufacturing and industrial concerns has multiplied several fold during the six years that the present tariff law has been in effect shows that industry, broadly speaking, has had ample protection. In the meantime, agriculture has been struggling for its very existence. The situation calls for the exercise of wise and far-seeing statesmanship.

It is sheer folly and delusion for the other groups in our national life to expect prosperity to be permanent unless its benefits are shared with agriculture. Ferrero, one of the greatest of modern historians, scanning with the eye of a scholar and philosopher the records of more than 2000 years, sums up his findings in this terse conclusion:

"The only durable conquests, even in the ages of barbarism, are conquests made by the plow."

# Limitations, Advantages, and Special Field of Direct Marketing

By Gilbert S. Watts
Grower, Bellwood, Pa.

THE term direct marketing, as applied to the agricultural field, ordinarily is considered to mean the movement of farm products from producer to consumer without the offices of an intermediate agency.

For a great many years it has been popular to condemn the "middleman." Much talk and ink have been expended in bemoaning the farmers' "35-cent dollar." Elimination of the middleman, direct marketing, has been thought by some to be the golden objective, attainment of which would clear away many of the farmers troubles and bring to him an adequate reward for his labors. However, it is safe to say that all this agitation has produced no visible changes for the sufficient reason that in most instances no one has discovered a means of dispensing with the services rendered by the "middlemen," the intermediate distributing and selling agencies.

It is not this writer's purpose to condemn the existing machinery for the distribution of farm products. Neither will he endeavor to present direct marketing as a solution to general marketing problems. Careful study of the field permits no other deduction than that present means of marketing are the best ingenuity has been able to devise. Granted that the spread is wide between what the producer receives and what the consumer pays it is no wider in the case of agricultural products than in the case of many manufactured articles. The allegation that this spread is unnecessarily wide is not supported by the fact that competing agencies, both wholesalers and retailers, continually must seek means of reducing costs, of eliminating waste, in order to meet competition and live. In this machine age, and we must not forget man power has been multiplied in agriculture even as in other industries, it should not be astonishing that it costs more to distribute many things than to produce them. In as much as labor is one of the largest items in the cost of distribution, the spread between what the producer receives and what the consumer pays is not likely to narrow a great deal in the near future. The wider this margin remains the greater the inducements to direct marketing.

## Development of Direct Marketing

The relatively recent great increase in mileage of hard surfaced highways is a factor favorable to further development of direct marketing. Smooth highways invite urban dwellers to drive into the country to fill their market baskets. They make it easier for the farmer to bring his products to the consumer. In this connection, improvement of important secondary and country roads deserves early consideration.

That the possibilities of direct marketing have not been exhausted, even in communities where retail farmers markets have been in operation for many years, is illustrated by data secured in studies of a number of Pennsylvania markets. For example in Altoona, a city of approximately

75,000 inhabitants, 28.9 per cent of the eggs and nearly 90 per cent of the potatoes were received from distant sources in 1922.[1]

It also is worthy of note that increases in the number of sizeable towns and cities in regions which now are purely agricultural will widen the field of direct marketing.

## LIMITATIONS OF DIRECT MARKETING

Unquestionably the greatest limitation of direct marketing of agricultural products is the remoteness of the more important producing areas from the large centers of consumption. The length of haul of agricultural products arriving in the large cities commonly reaches into hundreds, even thousands of miles. The modern trend toward specialized production of crops in regions that have proven especially favorable in season, soil or climate, makes it unlikely that the average length of haul of the future will be less.

In this connection the question has been asked: "Why should not a group of remote producers organize and sell direct?" This very thing has been done. However, operating experience shows that the costs of distribution through such grower controlled organizations closely approximate, may be even higher, than the cost of similar services rendered by privately owned distributing agencies operated for profit. Distant distribution simply can not be accomplished without intermediate and terminal agencies.

Another insurmountable limitation to direct marketing of a great bulk of farm products is the processing or manufacture which these require to put them into useful or acceptable forms. Thus grains are milled into flour, feed or breakfast foods; cotton and wool are spun and woven into fabrics and for the most part made into garments; cattle from far away ranges are converted into steaks, roasts, gelatin, glue, fertilizer, and hides, these last finally into leather and leather articles. Direct marketing of these and other "raw materials" produced on the farms and ranges is out of the question. Only in exceptional instances is it feasible for the farmer to sell directly even to the mill, factory or abattoir. A genuine and practically indispensable service is rendered by elevators, warehouses and stockyards which receive varying products as they arrive from the farm and grade or classify them into lots that will meet the requirements of different buyers.

Another factor that tends to limit direct marketing is the great seasonal fluctuation in output which is experienced by the individual producer. Thus the poultryman, the orchardist and the gardener may have more of their wares than they can move directly to consumers at one season and a shortage, even nothing at all, at another season. It is relatively difficult, though by no means impossible, to build retail trade in the face of this difficulty. The dealer on the other hand is in contact with a number of sources of supply and is in position to afford his customers dependability of stock.

The greater expense of direct marketing, calculated on a monetary basis, scarcely can be considered a major limiting factor. In several Pennsylvania cities, on retail curb markets, in retail market houses and in retail peddling the average selling costs were 9.7 per cent, 10.35 per cent and 11.04 per cent respectively.[2] These figures are sufficiently low to show substantially

[1] Bulletin No. 184, Pennsylvania Agricultural Experiment Station.

[2] General Bulletin No. 454, Pennsylvania Department of Agriculture.

larger net returns from direct marketing than from wholesaling.

Probably a more important limiting factor than the added expense is the distraction, the division of time and energy, required by direct marketing. Viewed from any angle marketing is a separate function from production. The added burden of selling numerous small lots to consumers as compared to selling a few large lots to dealers is not inconsiderable. Thus, even where direct marketing is feasible, the producer must choose between division of his energies in the expectation of larger returns per unit and concentration in an effort to secure larger or more economic production.

Another limiting factor is the difficulty of securing efficient and dependable salespeople. This situation is aggravated by the seasonal and irregular nature of direct marketing on most farms. With the exception of dairymen few farmers are in position to give steady employment in selling.

Distaste for selling or inaptitude toward meeting and pleasing all sorts of individuals can not be overlooked as limiting factors in direct marketing. Many people simply do not like to sell. Others are unsuited by disposition or temperament.

In summing up, the necessity of manufacture before use and the remoteness from centers of population of the origin of many agricultural products inalterably restrict the field of direct marketing. Within the range of territory and products in which direct marketing is possible certain other factors tend to limit the employment of this method of distribution. On the other hand, under favorable circumstances direct marketing may prove, in many instances has proven, a complete solution of the marketing problems of individual farmers.

## ADVANTAGES OF DIRECT MARKETING

The most widely recognized advantage of direct marketing is the securing of full retail returns for the producer. Complete realization of this advantage is dependent upon the seller's full knowledge of going market prices and his ability to get them. Furthermore, if this advantage is to be actual, the net returns from direct marketing must exceed the net returns that could be secured from wholesale marketing. That this ordinarily is the case is indicated by the figure 10.14 per cent which was found to be the average cost of direct marketing as conducted in six Pennsylvania cities.

An important but less obvious advantage of direct marketing is the encouragement which this form of marketing gives to diversify production. The producer who is in regular contact with consumers continually receives requests for commodities which he does not have. He is tempted, frequently induced, to add additional products to his line. Thus the period over which regular income is secured is lengthened and dependence for income, instead of resting on one or a very few crops, as in the case of the specialist or distant shipper, is distributed between a number of projects and crops. Moreover, the diversification which develops in connection with direct marketing often results in a variety of projects, poultry raising, berry production and so forth, which provide light, agreeable and profitable employment for members of the farmer's family. Direct marketing together with a system of diversified production that has been evolved to meet local demand go to make a remarkably staple farm business. Doubtless direct marketing plus such diversification played no small part in maintaining the relatively greater de-

gree of prosperity enjoyed by farmers situated in the northern and eastern states during recent years of agricultural depression in the plains regions.

One of the great advantages of direct marketing is the opportunity which it affords the grower to place his products in the consumers' hands in the freshest possible condition, at their best. This advantage should be stressed and capitalized to the fullest extent by direct marketers. Shippers continually are devising improved means of handling, packing, icing and so forth. Ocean and railway refrigeration services are growing more and more efficient. Those growers who deal directly with the consumer can not afford to overlook any detail affecting the conservation of quality in their products. In fact those who market directly are in position with certain products, strawberries for example, to plant and grow varieties of unusually high quality which are too perishable to meet shipping requirements.

Direct marketing affords unique opportunities to those who would develop a special trade for products or packs of unusual quality and great dependability in respect to quality. Thus a swine grower has developed a large trade for a distinct one pound package of superior sausage which contains all the choice meat including hams. A market gardener has built up a discriminating trade for fresh peas which must be the last word in quality to pass his inspection. Another offers a trade-marked, parchment wrapped bunch of celery hearts that always is the acme of quality. Each of these three producers, and they are typical of what is being done on a limited but increasing scale, sells at one standard price throughout his marketing season year in and year out.

Checking on other prices may be considered as one of the advantages of direct marketing. On occasion this tendency may be of great effect. However, competition between retailers other than producers ordinarily is an adequate check. In fact when such competition devolves into a price war or into general employment of certain farm products, potatoes for example, in the rôle of "loss leaders" serious injury may be done producers through abnormal depression of prices.

Another advantage of direct marketing is personal contact with the consumer. Grievances may be detected easily and adjusted promptly. Unusual opportunities are afforded to cater to peculiarities of demand and market preferences. The farm production program can be kept in close step with the outlet. There is no necessity, if good judgement is exercised, for the occurence of great variations between the extent of the crop and the capacity of the outlet.

Direct marketing sometimes may be the means of finding an outlet when other channels fail. For example, a market may be "glutted" with tomatoes in September. Prices are so low that dealers find it practically impossible to handle so bulky and perishable a product inside the margin available. Yet enterprising individual growers sell great quantities directly to home canners on mutually advantageous terms.

Summing up, the most important advantages of direct marketing of farm products unquestionably are the realization of full retail prices by the grower and the placement of perishable products in the consumers hands in the freshest possible condition.

## THE SPECIAL FIELD OF DIRECT MARKETING

The possibilities of direct marketing have been realized to the greatest extent in sections where producers are

situated on fertile soils in proximity to important centers of consumption. This combination is found most frequently in the New England and Middle Atlantic States and in parts of the Central States. However, in practically every state at least several of the larger centers of population provide opportunities for direct marketing. Hard surfaced highways and modern speedy motor vehicles are widening greatly the radius within which direct marketing may originate in the country surrounding every city. Of 1,305 loads sold in certain Pennsylvania cities 51 per cent originated within radii of 10 miles, 43 per cent with radii of 20 miles and 6 per cent of greater distances.[2] In fact it is not uncommon for loads of products which are relatively high in value in proportion to bulk to be hauled a hundred or more miles to market.

Direct marketing has proven particularly adaptable to the requirements of relatively small producers, those whose operations are neither so extensive or intensive as to prevent them from finding time for the details and niceties that are likely to be well rewarded in dealing with the consumer. Moreover, those whose production is rather definitely limited by facilities, circumstances or preference are inclined to seek the outlets which will yield maximum returns per unit. On the contrary, the large producer quite commonly is contented with a more narrow margin and the release from much detail in selling which permits him to concentrate on lowering costs and increasing production.

It also is worthy of note that direct marketing, as compared to other means of distribution, has attained greatest relative importance in large towns and in small and medium sized cities rather than in great metropolitan districts. Probably several factors have been of influence in this connection, not the least of which are the economic difficulties encountered. Returns per square foot from a market house in many instances can not be made to reach the figure various commercial or manufacturing interests can and will pay where competition for good locations is keen. Likewise the imperious nature of traffic problems has forced the abandonment of retail curb markets in numerous instances. Retail peddling has been banned by legislation in parts or all of many large cities.

Furthermore, a survey of the special field of direct marketing reveals the fact that certain products are particularly adaptable to this method of distribution. Market milk, especially in the smaller communities,—keeping in mind that such a community may be a section of a large city, long has been marketed directly on a large scale. The farmer "milk-man" in many instances has been able to meet the competition offered by large dairy companies. The various horticultural products, fresh fruits, vegetables, berries, even cut flowers, make up a tremendous proportion of the direct marketing movement. The perishable nature of these commodities favors the producer who can place them directly in the consumer's hands. Eggs, home dressed poultry and meats, honey and maple products all are marketed directly on a large scale.

Direct marketing has developed into several distinct forms each of which operates in a special field.

*House to House Peddling.*—This common method of direct selling may take two forms. In the transient form the seller canvases likely territory on occasion. However, the highest development is reached in the regular route

[2] General Bulletin No. 454, Pennsylvania Department of Agriculture.

along which a dependable grower may serve satisfied customers throughout a long term of years. Regularity of production and delivery are two essentials in the establishment and maintenance of this sort of outlet. It also is advantageous to have a supply of produce throughout the major portion of the year.

*Curb Markets and Retail Market Houses.*—In numbers of cities this class of markets is of great importance. There are approximately 125 in Pennsylvania alone. As implied by the name, curb markets are conducted outdoors upon sidewalks or streets. The advantage of this system is the elimination of capital expense. However, supervision during selling hours and provision for cleaning up after the market closes are practically essential. Exposure to inclement weather is the great disadvantage attending curb marketing. In the larger cities increasing traffic congestion has forced the abandonment of many curb markets.

The retail market house provides covered space for the display and sale of the products offered. It may be constructed by private capital and be managed for profit. In other instances it may be financed by municipalities, or coöperatively by the marketers. In this connection experience has demonstrated that heavy overhead may prove a serious or fatal burden. To compete successfully with retail dealers the market house must be located favorably, usually centrally in a populous residential section or near the center of the city. It has proven difficult to establish market house or curb markets in cities in which the habit of personal marketing is not common. It is a common practice in the management of market houses to rent a number of stalls to dealers in order to insure a volume of trade throughout seasons of the year when local farm production is slack. As a rule farmers are permitted to fill out their stock with purchased goods for the same reason. However, it should be stressed that the major attraction of the market house to the consumer is the opportunity for purchasing farm products at first hand.

*Parcel Post Marketing.*—Through this system of direct marketing comparatively remote producers may establish contact with consumers. The requisites are a superior product, ability and determination to grade fairly and to pack attractively. Producers who wish to market by parcel post usually may find customers through friends, relatives or acquaintances in the city. Likewise city dwellers may seek reliable producers through correspondence with country friends. Eggs, butter, fresh vegetables, fruits, nuts, honey and maple products are especially adaptable to parcel post marketing. Possibly on account of the details involved in ordering, packing, collecting and the difficulties of adjusting differences at a distance parcel post marketing has not assumed the proportions which some had expected. However, a producer who is prompt and fair and who puts out a thoroughly dependable product can build a worth while parcel post business.

*Selling from the field or orchard.*—This form of direct marketing reaches great proportions at the height of the harvest in some sections. Potatoes, cherries, grapes, peaches and so forth may attract consumer buyers from surprising distances. Practically all of the usual marketing expenses are eliminated, in consideration of which prices ordinarily are set at more attractive levels than are possible where transportation to market is required. Roadside bulletin boards, direct mail and newspaper advertising are commonly and effectively employed by

producers who sell directly from the field or orchard.

*Roadside Marketing.*—This is the most recent noteworthy development in direct marketing. It has come into being with the widespread building of good roads and the universal use of the automobile. Although roadside marketing already has attained great importance the movement is decidedly young and it does not seem unreasonable to expect far greater developments in the future. Experience must be gained by producers, systems of production must be adjusted to the new demand, and customers must be won to the idea of filling their market baskets in the country as part of the enjoyment of an afternoon's or evening's drive. Moreover, the roadside market, to a degree that no other form of marketing may approach, enjoys the special advantage of making available to urban dwellers the good things of farm, garden and orchard at their absolute best.

# Market Information and the Farmer's Problems

By F. F. Lininger

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THERE is no general agreement as to the cause of the agricultural depression since 1920, neither is there any unanimity of opinion concerning the remedies for the situation in which farmers have found themselves. Whether the farmer's plight arises wholly or in part from high handling costs resulting from the lag in wages in the post-war deflation period; or from an overproduction of farm commodities stimulated beyond the peace-time needs by the heavy demands of the war, and made possible by the tremendous technological developments in the last decade; or from a combination of circumstances in which each of these, and other alleged causes, are determinants, the fact remains that to the farmer, the real difficulty has been expressed in the form of low prices for products sold, and high prices for commodities purchased.

Ask farmers themselves what the trouble is, and the answer invariably comes back "Prices." What the farmer needs most is a higher purchasing power for the products he sells, regardless of how it is obtained. Either higher prices for products sold by producers, or lower prices for products purchased by them, will result in increasing the purchasing power of the farmer's dollar, and thus bring relief to the farming population.

But what is the rôle of market information in such a farm relief program? Since the farmer's situation is reflected in the relative prices of farm products, it is evident that if the use of market information is to advance the status of agriculture, it must manifest itself by favorably influencing the price situation. That is, the use of market information must help the farmer to get more money for his products.

There is evidence to prove that through the application of market information, sometimes individually, but chiefly through coöperative effort, farmers have favorably influenced the price of commodities purchased by them.

Thus, by delaying his order one month in the summer of 1928, a manager of a local coöperative purchasing association in Pennsylvania, by correctly interpreting conditions prevailing in the feed market, was able to save approximately $5.00 a ton on dairy feed purchased for farmers.

On the other hand, the manager of a near-by association, with little attention to the market situation, placed his order immediately, with the observation "Everybody knows feed prices are going up." The members of his organization paid $5.00 per ton as a penalty for the manager's indifference to prevailing market conditions.

The purpose of this paper, however, is not primarily to present the importance of market information as applied to the purchase of commodities by farmers, but rather to point out the significance of market information in the sale of farm products. It is evident, that farmers can not artificially "boost prices" by the proverbial "bootstrap" method; however, the more orderly marketing of farm products will result in higher average prices to all producers. Nevertheless, since the use of market information helps principally certain farmers as individuals to realize better prices, the tendency

will be through competition to eliminate those producers who do not intelligently use available information. The level of prices to remaining producers must thereby be raised through a diminution of the total supply. It is not intended, however, to amplify the statement that the general level of farm prices will be raised by forcing out marginal producers, although this is a factor in the long run. The real object of this paper is to point out that, through economic education, farmers, as individuals, will be placed in an advantageous position to work out and solve, in part at least, the problems presented by the relatively low level of prices for agricultural products. A most effective way to farm relief lies in familiarizing farmers as individuals with market information. It is the opinion of the writer that economic education is the "farmer's best way out."

At the outset it is well to keep in mind the fact that while highest possible prices are the farmers objective, it is not highest "gross" prices, but highest "net" prices, that are most important. Every farmer must realize that there are certain costs of marketing which he as producer must bear. For example, in a study[1] of egg marketing by farmers in Pennsylvania, it was found that the average gross price received for eggs sold to New York wholesalers was 41.7 cents per dozen, while eggs sold to hucksters brought only 38.4 cents per dozen. However, after deducting the marketing costs, 4.7 cents per dozen when eggs were sold to New York wholesalers; and but five-tenths of a cent per dozen when sold to hucksters, it was found that the net price to producers was approximately one cent a dozen higher when eggs were sold to hucksters. Parenthetically, it may be mentioned in this connection, since it has significance later in the discussion, that the net price obtained from hucksters was the higher because in many instances the latter sold the eggs direct to consumers in near-by cities.

[1] Lininger, F. F. "Egg Marketing by Farmers in Pennsylvania," *Bulletin 214*, Penna. Agr. Exp. Station, State College, Penna., August, 1927.

## MARKET INFORMATION NEEDED BY FARMERS

What kind of information do individual farmers need, in order to net the most advantageous prices for their products? Perhaps if we state the case in the form of questions, or problems, and attempt to secure answers for them, we shall come to a better understanding of the farmer's need for market information. From the standpoint of highest net price, producers are constantly seeking answers to these questions:

What to sell?
When to sell?
Where to sell?
How to sell?

## WHAT TO SELL

There are distinct limitations as far as commodities are concerned, which restrict the kind of products farmers may produce for sale. Factors, such as climate, soil, topography, and marketing costs, limit the range of products adapted to a given locality. Spillman[2] divides the crops into two groups: The minor crops and the major crops. The minor crops include all those which occupy less than 37,000,000 acres each; while the major crops consist of corn, hay, wheat, oats, and cotton, each having more than 37,000,000 acres devoted to its production. It is his opinion that the acreages of the minor crops only may be adjusted

[2] Spillman, W. J., *Balancing the Farm Output*, Orange Judd Publishing Company, 1927.

in accordance with market demand through the use of outlook and intention reports issued by the Bureau of Agricultural Economics. Thus, the farmers of the country are wondering this spring about the acreage of potatoes they should plant, in view of the very low prices prevailing for the 1928 crop. Reports in January from eleven early potato growing states from Texas to Maryland indicated that farmers intended to decrease the acreage 29 per cent from that of last year. Reductions ranged from 13 per cent for Arkansas to 43 per cent for Oklahoma. However, the acreage of the major crops may also be adjusted, though on a somewhat smaller scale. For example, with the farm price of wheat less than $1.00 a bushel in the fall of 1928, farmers reduced the acreage of winter wheat eight per cent below that of the preceding year.

"What to sell," however, is a question which relates not only to what *commodity* to sell, but also to what *quality* and what *grade* of a commodity shall be sent to market. Shall it be a 150-pound hog, or a 250-pounder? Shall it be United States fancy potatoes, or United States No. 1's? Immediately, the demands of the particular markets appear, and suggest answers which come in the form of price differentials for the various classes and grades of farm products. Here then, is an additional need for a certain type of market information—rice quotations on the different grades of commodities.

### WHEN TO SELL

"Shall I hold potatoes this fall, or sell out of the field?" "How about wheat, corn, apples, cotton, tobacco, shall I sell or hold?" These are the questions farmers are asking at harvest time. The same type of questions are asked by livestock producers. "Hogs, steers, lambs, shall I sell now, next week, or next month?" How shall they be answered? Information on the general conditions of business, the nature of the demand for the various products, its trend and seasonal character, is needed in order to furnish a basis for sound decisions. Another set of market information is required to give information on the prospective supply of the various crops and livestock.

### WHERE TO SELL

In many areas of the country this question is not significant as there is perhaps only one central market in which surplus sales may be made. This is true of surplus areas far distant from market. In the eastern part of the United States, however, it is a very important question as there are many markets available. For instance, in the case of a Pennsylvania poultryman —shall he ship his eggs to New York City, Philadelphia, or Pittsburgh? Or, shall he send them to one of the small industrial cities, 50 or 75 miles distant? Or, shall he perhaps deliver them himself directly to the consumers in the near-by mining town? As another illustration, consider the western New York potato grower. Shall he sell locally, or ship to New York, Philadelphia, Pittsburgh, or Washington? Price quotations in the various markets are essential to his decision, as are also a knowledge of the transportation and other marketing costs.

### HOW TO SELL

In the East, this is another important question. Many farmers are so situated that they can market direct to consumers. In the city of York, Pennsylvania, 83 per cent of the families buy eggs direct from farmers either delivered at their door, or at the

public market.[3] In Pottsville, Pennsylvania, 66 per cent of the consumers buy eggs from farmers. In the latter city, 88 per cent of the consumers visited, reported that they bought poultry from farmers who delivered to their door. Direct marketing is at all times an important consideration to producers located near to market. In the present period of high distribution costs it becomes still more significant, since it offers an opportunity for producers to perform middlemen's services at high wage levels.

Much information is needed to enable producers to decide intelligently how to market. Prices in the wholesale and retail markets are essential. The costs of marketing by the various methods are also necessary. The character of the demand, such as racial differences, consumer preferences, and the like, are factors which modify the returns to producers.

In the accompanying illustration is presented a teaching device, which the writer has designed for presenting to students of marketing, a graphic outline of the type of marketing information that a farmer needs in order to net the highest prices for his products. In summary, a farmer needs information on the prices of products, their seasonal and cyclical nature, quotations in different markets, and the trend of prices over a period of years. He also needs information on the total supply of those products which he grows, competing areas, seasonal production and marketing, and the effect of price on production. On the demand side, general business conditions, the nature of consumers' demands, their preferences, various racial and income differences, should be known by producers.

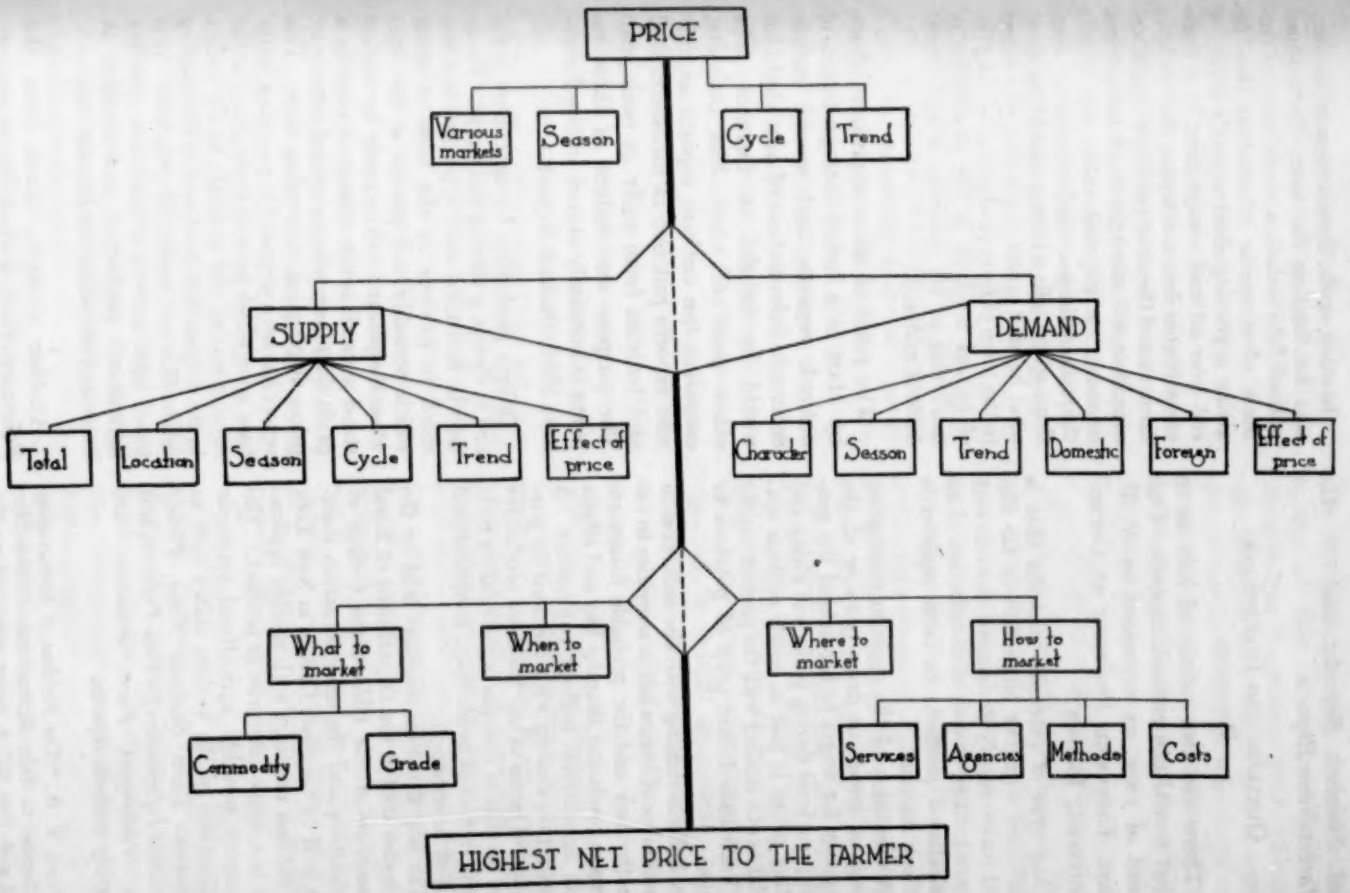
[3] Lininger, F. F., and Charles, T. B., "A Study of Egg and Poultry Consumption in Pennsylvania," *Bulletin 222*, Penna. Agr. Exp. Station, State College, Penna., March, 1928.

A knowledge of the costs of marketing through the various services, by the different agencies and methods, is also essential, in order to enable farmers to decide intelligently what, when, where, and how to market.

## SOURCES OF MARKET INFORMATION

The sources of information helpful to farmers in marketing their products may be classified as private, and public. Included under the heading of private agencies are newspapers, banks, trade publications, manufacturing and merchandising organizations, brokers, and professional business analytical services. This recital does not by any means exhaust the list of private agencies, but is suggestive of the large amount of information available from this source. From the farmer's point of view, the most important sources of information are public. A broad, impartial viewpoint, usually but not always evident in private reports, is essential, and, therefore, public agencies collect and disseminate market information. The public sources may be subdivided into federal and state agencies. The chief federal agencies are the United States Departments of Agriculture and of Commerce. In the various states, the departments of agriculture and state colleges of agriculture constitute the chief agencies, the latter being chiefly concerned with the analysis and dissemination, rather than the collection of data.

Most important in the list of market reports are those issued by the United States Department of Agriculture through the Bureau of Agricultural Economics. The chief statistical reports of this bureau, which are of direct interest to farmers, may be grouped under three headings: (1) the *Outlook and Intentions Reports;* (2) the *Crop*




GRAPHIC OUTLINE SUGGESTING VARIOUS TYPES OF MARKET INFORMATION NEEDED BY FARMERS

*and Livestock Reports;* and (3) the *Market News Reports.*

### OUTLOOK AND INTENTIONS REPORTS

There are two points of view as to what constitute outlook reports. One point of view, as expressed by V. B. Hart, Extension Professor at Cornell University follows:[4]

Any type of extension material that is concerned with the immediate or far distant future supply or demand, price or cost of production, or cost of distribution of an agricultural product, or farm supplies is outlook material.

A discussion of the cycle in purchasing power of horses or dairy cows or of the tendency for wages to lag behind the general price level during periods of rising and falling prices is just as much outlook material as one dealing with the present supply or immediate future price of potatoes or cotton.

A bulletin dealing with the reduction in the number of horses left in our cities to eat timothy hay and the probable future returns in producing timothy hay and alfalfa is an agricultural outlook publication. A news article dealing with the need for purchasers of farms to buy the more productive land because of changes in the relative costs of the factors of production, is agricultural outlook information.

The hog situation meetings held by the extension staff of the Department of Rural Economics of the Ohio State College of Agriculture and the dairy situation meetings held by the State College in New York are outlook meetings with specific application to a single enterprise or product. The numerous monthly agricultural economic publications of the various states such as *Minnesota Farm Business Notes, Timely Economic Information for Ohio Farmers,* and *The Washington Farm Situation,* are monthly outlook reports.

[4] Hart, V. B., "The Problem of Encouraging the Farmer to Take Agricultural Outlook Material and Use it," a paper presented at the Annual Meeting of the Farm Economic Association, Chicago, Ill., December 27-29, 1928.

In other words, there is no more justification for limiting the term, "agricultural outlook," to include a single seasonal outburst of economic information than for giving a growing child a year's supply of cod liver oil and orange juice in a single concentrated dose and hoping that both the farmer's and the child's ability to digest and assimilate will stand the shock and prevent economic or physical colds and rickets throughout the next twelve months. Anything which tells a farmer something about what he may expect in the future in regard to the price of farm products or of the price of factors involved in the production or marketing of his products is agricultural outlook material.

The point of view expressed above by Hart is a broad interpretation of outlook reports, and would include economic information of any kind that would be helpful to farmers. The other point of view, less inclusive, considers the outlook reports as definite reports put out in mimeographed and bulletin form early in each year. The purpose and nature of these reports is concisely stated in the February, 1925, *Outlook Report:*

Orderly production for agriculture is the end in view in preparing this report. Farmers who determine what to produce and how much to produce on the basis of prices which probably will prevail at the time when the product will be ready for market stand a much better chance of securing a profit than those who are guided entirely by prices at planting or breeding time. This report has been prepared to provide a better base upon which farmers make plans for the coming season, and especially to aid leaders in the coöperative movement in formulating production and marketing programs. It is based upon surveys of conditions affecting agricultural production and demand at home and abroad at the present time.

Another excerpt, taken from the February, 1928, *Outlook Report* conveys an idea of the personnel of the staff making the report:

In the preparation of this, the *Sixth Annual Agricultural Outlook Report*, all the facilities and the entire staff of the Bureau of Agricultural Economics have been drawn upon. Assistance was rendered by representatives of other bureaus of the department and by representatives of the agricultural colleges, experiment stations, or extension forces of 21 states, who participated in the conference in Washington at the time the report was prepared.

The general outlook issued at the beginning of the year is supplemented from time to time with an outlook report for important products. In these reports the various supply and demand factors are presented and the current statistics analyzed. In addition to the outlook report issued at Washington, many of the state colleges issue a report for their own state in which the facts of the federal report are interpreted in terms of the needs of the farmers of these states.

Following the outlook report issued early in the year, a report of farmers' intentions to plant on March 1 is issued. The intention summaries include reports of some 50,000 farmers. The planting intentions, while not a forecast of the acreage that actually will be planted, are indications of what farmers intended to plant at the time of reporting. Planting intentions issued in the spring of 1928 covered the following crops: corn, spring wheat, durum wheat, other spring wheat, oats, barley, flaxseed, rice, grain sorghums, potatoes, sweet potatoes, tobacco, peanuts, and tame hay. Reports of intentions to plant cotton are specifically prohibited by national legislation. Intentions to sow winter wheat and rye, as of August 1, are issued each fall. Farmers' intentions to breed sows, for fall and spring litters, are also published each year.

### CROP AND LIVESTOCK REPORTS

Early in each year, the Secretary of Agriculture announces the exact date when the monthly crop and livestock reports of the Department will be issued during the ensuing year. These reports contain estimates of the acreages, conditions, yields, and farm reserves of the principal crops throughout the season, and the number and value of farm animals.

### MARKET NEWS REPORTS

These reports on the markets, prices, and movements of agricultural products are released from Washington, and also from branch offices in a large number of cities and towns throughout the United States.

The three types of reports described above and issued by the Bureau of Agricultural Economics are largely statistical. The research work of the federal department, and of the various state agricultural experiment stations reported in federal and state bulletins, provide another very large source of marketing information. Taylor[5] states:

> During the year [the fiscal year 1926–27] . . . there were 332 projects in agricultural economics in progress, in the agricultural experiment stations of the United States; there were 228 research workers devoting all or part of their time to this field of work, and approximately $800,000 was expended by these institutions. In addition to this, approximately an equivalent amount of energy and funds was being expended in this field by the United States Department of Agriculture and the privately endowed research institutions.

Specifically, on the one topic of adjusting production to market requirements—the "what to sell" query of farmers—Doctor Tolley, in charge of the research program of the federal bureau, says:[6]

[5] Taylor, Henry C., "Research in Agricultural Economics," *Journal of Farm Economics*, Vol. X, No. 1, page 33, January, 1928.

[6] Tolley, H. R., "Adjusting Production to

First, there are studies of the market requirements for the important commodities, such as are being carried on in the bureau. These studies are showing both the quality and quantity of the commodity required by the market, whether that market be regional, national, or international, and throw much light on the forces that determine prices by measuring at least approximately the importance of the various conditions which control both demand and supply.

A second type of research is represented by the investigations of factors affecting consumer demand. Through these studies we endeavor to learn directly from consumers the relative importance of the various factors which determine the rate of consumption of a given product. Surveys in several important cities on milk, meats, raisins, citrus fruits and cranberries have been made in the past two years. The value of these studies is apparent when we remember that in the last analysis the consumers of a product determine what the market requirements are and what the price will be.

Studies of the market requirements of specific areas and opportunities for producers within the area to devote more of their energies to supplying the near-by markets represent a third type.

A great deal of the marketing information of the Federal Bureau first appears in mimeograph form, and then later in the various printed publications, such as *Crops and Markets*, a monthly publication, and the *Yearbook of the Department of Agriculture*. *The Agricultural Situation* is a monthly publication of the bureau which gives an interpretation of the market happenings for the month.

## THE APPLICATION OF MARKET INFORMATION

The real test of the value of market information lies in its application to the specific problems of the farmer. From the great mass of information available, is it possible to glean something like answers to the four abiding questions of the farmer: "What, when, where, and how shall I sell, in order to obtain the highest net price?" In other words, what do all these statistics and expert calculations mean to the farmer himself? The potato crop in the United States in 1928 was reported to be 463 million bushels, but how shall the potato grower in New York, or Pennsylvania, or Wisconsin translate it into dollars?

Leon M. Estabrook,[7] formerly chief of the crop reporting service of the United States Department of Agriculture, has this to say on the problem of applying market information:

> The key to the successful use of crop and market reports is in their proper analysis and interpretation through comparisons to show the bearing of the essential facts disclosed by them on relative supply, relative demand, and relative prices for a given locality, the State, the United States, or the world, past, present, and future. In studying the crop and market reports a farmer or a farmer's representative should, therefore, note the past records of production, commercial movement, consumption, stocks, surpluses and deficits, prices, and whether the current reports indicate more or less of these factors in comparison with the reports for the same date or period last year or the average for several years, and from these comparisons and a study of trends, he should try to forecast the probable relative supply, relative demand, and relative prices for the future. Of course, other factors influencing the effective supply, effective demand and prices must also be taken into consideration, such as transportation, the supply of capital for financing crop movement and marketing, interest, discount and exchange rates, industrial activity or idleness, business prosperity or

Market Requirements," address before the Annual Meeting of the National Association of Marketing Officials, Chicago, Ill., December, 1925.

[7] Estabrook, L. M., "The Use of Crop Reports by Farmers," *Journal of Farm Economics*, Vol. V, No. 1, page 28, January, 1923.

depression, relative purchasing power of consumers, strikes, lockouts, embargoes, tariffs, war and rumors of war, and the like. But after all, and in spite of the complex problems involved in any attempt to forecast supply, demand, and prices as a basis for action, the individual farmer or farmer's representative can use the crop reports as a practical guide by simply noting carefully whether they indicate more or less than last year or than the average. If more, prices are not likely to advance and may not be maintained. If less, prices are likely to advance or at least to be maintained. This simple working rule applies generally to local, national, and world conditions and is the one that farmers can best use as individuals. Crop and market reports can be used to the best advantage, however, by experienced business managers and officials of farmers' organizations.

The statement that market interpretations may be made by both farmers and specialists in the field of market analysis suggests two phases in the application of economic data. First, there is the information that may be directly applied by farmers, and secondly, information that must reach farmers indirectly through the efforts of specialists, both in analysis and dissemination. The fruits of research work in price analysis and market information are apparent when certain principles can be developed and then put to use by farmers themselves. It must be clear, however, that after all, principles are only beliefs which we arrive at, after studying certain facts, and as such may be constantly changing with the accumulation of additional facts.

Specifically, let us see what use may be made of the three previously described types of reports, issued by the Federal Bureau of Agricultural Economics. Consider the *Outlook and Intention Reports*. Spillman[8] has made a study of the application of these reports, and says:

In the 1926 *Outlook Report*, issued February 7, by the United States Department of Agriculture, the following statement occurs concerning the potato acreage: "An increase of 10 per cent in acreage, with normal yields, is about the limit that would prove profitable."

At that time the price of potatoes was extraordinarily high, a situation that in the past had always led to gross overplanting.

Naturally there was some anxiety to see what the *Intentions Report*, to be issued March 19, would show. The data for the *Intentions Report*, were obtained by questionnaires sent to a large number of farmers after the *Outlook Report* had been made public. The answers to these questionnaires were summarized and the results issued in the *Intentions Report* of March 19. Instead of the usual large increase in potato acreage when the price of potatoes is high, the *Intentions Report* indicated that farmers were planning to increase the acreage only 4.3 per cent over that of 1925.

After the planting season was over a survey was made with a view of ascertaining the acreage planted. The results of this survey indicates an actual increase of two per cent.

However, farmers do not always follow a procedure similar to the recommendations made in the *Outlook Reports*. For instance, the outlook on potatoes issued in January, 1928, stated:

Present indications are that unless farmers change their plans there will be a substantial increase in the acreage planted to potatoes this year. Preliminary reports indicate that farmers in the North Atlantic and North Central States are planning an increase of about 14 per cent. Scattering reports from the South indicate an upward tendency but probably no material increases in acreage except possibly in North Carolina and Virginia. In some of the western states, where low prices are now being received, substantial decreases in acreage are to be expected, but the limited number of reports so far received do not indicate that

[8] Spillman, W. J., "Balancing the Farm Output," page 16, Orange Judd Publishing Company, 1927.

growers are as yet planning to make decreases sufficiently radical to offset the increases that are reported as intended in every state from Maine to Nebraska. If these January intentions are carried out, as they were last year, there would seem to be no section of the country where the chances will be in favor of returns from potatoes comparable to those secured during the last three years.

On March 22, 1928, in discussing the relation of farmer planting intentions to the *Agricultural Outlook*, the bureau reported:

Potato growers are planning to plant an acreage almost 12 per cent larger than harvested last year, in spite of the warning in the January outlook reports that any increase would probably result in lower returns.

The crop report issued December 14, 1928, showed that farmers did actually increase the potato acreage slightly over 10 per cent. In addition to the increased acreage the yield per acre was 121 bushels compared with 116 bushels for the previous year. The farm price on December 1, 1928, was reported to be 54 cents per bushel, while in 1927 the price was 96½ cents. Growers would have avoided considerable loss had they heeded the *Outlook and Intentions* warnings. The total farm value of the 1928 crop of 463 million bushels was only 250 million dollars, while a much smaller crop of 403 million bushels in 1927, was valued at 389 million dollars.

One of the chief uses of the *Crop and Livestock Reports* is in furnishing producers with information that will help them to determine when to sell their products.

Investigators have found that there are general relationships between the size of certain crops, and the seasonal trend of prices. Such relationships are valuable in furnishing farmers information as to time of selling. Thus, Scoville[9] has found that for potatoes, the New York wholesale price tends to rise from October to May in very small crop years, and to decline from October to May in very large crop years. The situation, however, is different for apples. In large crop years, the New York City wholesale price of apples tends to rise from fall to spring. The difference in the seasonal movement of prices for apples and potatoes is due in part to the storage requirements and facilities for the two crops. Potatoes will keep well in common storage, while apples require cold storage in order to reach the market in good condition in the spring. When the crop of potatoes is large, since common storage will suffice, producers have the alternative of selling or storing. With a very low fall price, large quantities will be stored. The large storage holdings may in the spring cause still lower prices when the crop must be marketed or lost. With apples, however, many growers are not in the habit of using cold storage facilities, and consequently, there is a rush to sell an unusually large crop in the fall. The result is a very low price and a "buyers' market" in the fall, rather than in the following spring, as for potatoes. Growers who store apples in large crop years do not have such a burdensome supply in the spring and generally encounter more favorable spring markets than fall markets. In the case of apples, there is also the factor of farm orchards competing in the fall of a large crop year with the commercial orchards, since most any kind of an orchard will produce a crop in a good year. The fruit, however, of poorly-managed orchards is of inferior quality and cannot be stored until spring, but does contribute to the "glut" in the fall market. While there are excep-

[9] Scoville, G. P., *Farm Economics*, No. 7, Cornell University, pages 56–59, 1925.

tions to these rules for forecasting the several trends of potato and apple prices, the odds are in favor of winning by adhering to the principles.

The *Market News Reports* furnish producers with information relative to what grades of products to market, and also help many farmers to determine when, where and how to market. Many of these reports are issued daily or more frequently, and are disseminated by mail, by wire and by radio. Thus, last fall, at Fort Worth, Texas, 100 carloads of cattle were received in one day. The *Market Reporter* broadcast this information and the next day but two carloads arrived and the market quickly recovered.

With a knowledge of market prices in New York and Philadelphia, poultrymen compare local prices with prices in the central market and, by making allowances for marketing costs, determine where and how to sell. Price quotations are also being used as a base for determining the local price, and furnish to producers a check on prices paid by local dealers.

Specialists in price analysis, who are beginning to issue forecasts of prices, illustrate the indirect application of market information.

The Federal Bureau is doing considerable research work in methods of price forecasting. Some of the state experiment stations, notably Kansas, have been using short time forecasts with considerable success and much favorable comment on the part of producers who make use of the forecasts. The "batting average" of the Kansas Station on wheat predictions has been shown to be 83 per cent, and on hogs 77 per cent. The price research work of the Federal Bureau has been criticized because it is not disseminated in usable form to farmers. For instance, Williams[10] says:

> What price research really needs is a ballyhoo man, a spieler. Somebody should apply the principles of salesmanship, the reiterative technique, the brand and package racket, the testimonial success dope, and all the other advertising tricks, to the job of selling this new idea to the farmer.

In conclusion, it is evident that the use of market information is essential to the farmer in selling farm products to the best advantage. There is some disagreement as to whether it should be given to him as raw data or in a somewhat predigested form. In any case, it seems clear that a large part of the responsibility for getting the information to the farmer rests on the agricultural extension service of the colleges and on the teachers of vocational agriculture in rural high schools. The farm papers are, doubtless, the next best agency to carry the "gospel" of economic education to farmers. It appears to the writer while there is no precision in all the endeavor of using marketing data, there is much that may be done to relieve the situation of the individual farmer by training him to interpret and use available market information. It is true that the weather, insect pests and diseases, through influencing the yield of crops, may greatly modify production, and, therefore, prices. On the demand side also unforseen situations arise. These, however, are reasons all the more why the farmer needs to think and act for himself in market situations.

[10] Williams, Carl, Editor of the *Oklahoma Farmer-Stockman*, "Continuous Economic Information Readily Available to Farmers," a paper presented at the annual meeting of the Farm Economic Association, December 27–29, 1928.

# A Foreign Policy for the American Farmer

By John G. Hervey, LL.B., Ph.D.
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SHALL the American farmer abandon all efforts to hold or extend his foreign markets and concentrate upon his domestic market? Shall he support a "stay at home" policy, both in trade and political affairs? Shall he seek an intensive cultivation of foreign sales and accept the political consequences of such a policy?

During recent years certain interests have sought to convince the American farmer that he should follow the first course. They have systematically minimized the importance of foreign markets for agricultural products and exalted the value of the home market. The present writer refuses to concur in this view.

## Agricultural Foreign Market

Prior to the World War the United States was primarily an agricultural country. Accordingly, such surpluses as we produced found their way, with slight governmental encouragement, to the industrialized countries of Europe. Half a century ago such products constituted four-fifths of our total exports, while at the outbreak of the World War agricultural commodities formed somewhat less than half of the total exports of the United States. The stimulus of war prices raised the ratio. Europe was the chief consumer in each instance.

The close of the war found the purchasing power of Europe diminished and the market for American goods seriously disrupted. American producers were forced to find new markets. Otherwise, their surpluses remained to glut the domestic market. The net result has been that agricultural products constitute a negligible per cent of our exports at the present time.

The blast from Mars of a decade ago wrought other important changes in America's economic life. The United States became a creditor nation rather than a debtor country. American capital has been going abroad at the rate of a billion dollars a year and ere long interest payments and instalments on principal will be moving to this country. Such payments will not be made in specie but in the form of imports. While it is true that French wine and Italian lace may not be sent directly to the United States, nevertheless such goods may find their way to Brazil or the Argentine, and coffee and hides in turn find their way to this country. At most payment will ultimately be made in goods, although the latter method is more circuitous than the former. The point is that American capitalists can be repaid only with goods and services and inasmuch as exports and imports must always balance, the less agricultural products which are shipped abroad, that much greater will be the amount of manufactured goods which may be exported from this country.

## Hope for Relief

The realization of these facts has led to the attempt on the part of partisan interests, in recent years, to convince the American farmers that their sole hope for relief lies in the intensive cultivation of the domestic market rather than in the development and capture of foreign ones. One author, writing in 1924, went so far as to declare that

For the United States to plan its agricultural future on the assumption that Europe may be induced to buy large quantities of foodstuffs at higher prices than now prevail would be to build on quicksand.

In August 1928, the same writer declared that developments subsequent to 1924 have demonstrated the truth of his observations. At the hearings before President Coolidge's Agricultural Conference in the early part of 1925, Mr. Hoover, then Secretary of Commerce, declared that the solution of the farmer's plight lies in the abandonment of the foreign market and concentration on the domestic market.

For more than ten years the agricultural interests of the United States have prayed for relief. They constitute approximately a third of the population. They have a capital investment which more than equals that invested in the manufacturing industries, mines and railroads combined, and yet they receive only about one ninth of the national income. Such is the affliction from which they ask deliverance. Thus a successful solution of the farm problem, regardless of the form which it may take, means essentially more money for the farmers.

From the farmer's point of view, relief may be had by either, or both, of two methods. These are, either a decrease in the costs of production, or an increase in the sale prices of agricultural commodities. It is urged that government is productive as well as protective and that measures should be taken looking to a reduction in the cost of the basic necessities, or else an increase in the sale prices of agricultural commodities.

However, a reduction in the costs of the basic necessities of agriculture is largely a domestic problem, the solution of which is outside the scope of this paper. It is urged that such costs relatively may be reduced through an increased duty on agricultural products coming into the United States, or through a reduction in the tariff on commodities which the farmer is required to buy, the price of which is elevated by the present protective schedule. The choice between the two alternatives is not clear. It suffices to say that no tariff can increase the price of agricultural products such as cotton and wheat which must be sold in a competitive international market. In so far as the foreign policy of the United States is involved, attention must be centered on markets for surplus products.

As regards markets, governmental efforts may either be confined to the territorial boundaries of the United States or extended to other countries. Thus far in the history of the United States attention has been primarily concentrated within the forty-eight states. Efforts have been made by the Department of Agriculture, the Department of Commerce, and various state commissions and bureaus to secure lower production costs for the farmers and higher prices for their products. Governmental efforts have been made, in fact are still being made, to show the farmers how to increase crop yields, and thereby increase the agricultural surplus. When the government seeks to enhance the output and refuses to lend its aid in the disposition of this surplus, it is working at cross purposes. If such be the policy of our government, and it appears to be, then governmental attempts to help the farmer increase his output are inimical to the best interests of the farmer.

It is to be noted that past governmental encouragement has come largely from the executive branch of the government. More recently attention has been centered upon the legislative department. The writer suggests a reconcentration upon the executive branch. The foreign market exists, or can be

created, and there is no reason to believe that the United States cannot, in the future as well as in the past, cultivate diplomatically these markets.

### AGRICULTURAL EXPORT OBSTACLES

In disposing of his agricultural surplus abroad, the farmer encounters three sets of obstacles. The first is ignorance. Many countries are not aware of the products which the United States has to sell. A potential demand for our products exists: it remains to be cultivated and made effective. This task is entrusted to the consular officers of the Department of State and the commercial attachés of the Department of Commerce which are located throughout the globe.

A more serious obstacle is encountered in the tariff hurdles of foreign countries which keep out American products, and in the embargoes which raise the price of basic commodities which American farmers must buy. The Department of State has succeeded in eliminating a part of these through commercial treaties. Chief consideration has generally been given to the question of tariffs. This has proved to be of special importance in European countries, where the tariff schedule, as set up by the national legislatures, are intended to serve as bargaining schedules only. Such schedules are subject to adjustment by the chief executive through the negotiation of commercial treaties. Furthermore, European tariffs usually deal separately with the imports from each country so that, in the past, American producers have been subjected to discrimination. Other countries have enjoyed more favorable treatment in the erection of tariff barriers. For many years the American divergence of interpretation of the most-favored-nation treatment clause in commercial treaties accentuated this difficulty. It is gratifying to note that the United States has now brought its interpretation in accord with the generally accepted view.

Newspaper accounts in recent months indicate clearly the need for alertness on the part of our diplomats in the field of treaties. Typical accounts from abroad are: "China Makes Plans for a High Tariff to Take Effect January 1, 1929," "Higher Rates on Imports Asked," "Spanish Tariff Greatly Increased," "Italy Increases Import Duty on Wheat," "New German Tariff Hits American Exports." Such headliners indicate that there is plenty of work to be done by our Department of State in keeping the avenues of international commerce open to American agricultural exporters.

### AMERICAN FOREIGN POLICY

Another factor often overlooked by the exporters of foodstuffs is that international trade is based on mutual understanding and good will and that purchasing power lies back of all international trade. One does not trade with his enemies if he can avoid it. Also, international trade, like local trade, is based largely on credit. Credit in turn is based on confidence and mutual understanding. Certainly the foreign policies of the United States have not instilled confidence in all foreign countries. A brief survey will locate the exact position of the United States on this point.

Turning first to our neighbors south of the Rio Grande we find that they have long regarded certain of our foreign policies as peaceful penetration to be resisted with armed force if necessary. Perhaps nothing has done more to arouse their distrust than the premature recognition of the Republic of Panama in 1903. The United States, early in the Harding administration, sought "to remove all the misunderstandings growing out of the political

events" in question through the payment of $25,000,000. Perhaps ratification by the Senate of the Bryan Treaty expressing "sincere regret that anything should have occurred to interrupt or to mar the relations of cordial friendship that has so long subsisted between the two nations" would have done more to regain the friendship of the Latin Americans than the final amendment which the Senate insisted upon. Obviously the payment of a paltry $25,000,000 has not erased all the bitter feelings and prejudices engendered in Roosevelt's "taking of Panama" and the eighteen years of strained relations between the United States and Colombia.

Latin America has viewed the Caribbean policy of the United States with alarm, more especially since 1917, when we flouted the adverse decision of the Central American Court of Justice. This episode seems unfortunate, the more especially since the movement for the court was sponsered by the United States. It would have been better if the court had not received its coup de grâce from the United States. Also, the colossal failure to effect a successful settlement of the long standing Tacna-Arica dispute has reduced the prestige of our country in certain quarters of Latin America.

Perhaps the good will flight of Colonel Lindbergh, the visit of President Coolidge to Havana, and the "good will tour" of President-elect Hoover have in a measure restored this prestige. However, Mr. Hoover would probably have aroused less criticism and inspired greater confidence in his country had he left the U. S. S. S. *Maryland* behind. It appears strange to some that the "evangelist of good will" should have come riding into their harbors on a battle ship.

The Monroe Doctrine has been a source of constant irritation. Only recently Costa Rica unsuccessfully attempted, through the Council of the League of Nations, to secure a redefinition on the part of the Department of State. A clear differentiation of policies on the part of this department is one of the outstanding needs at the present time. Although the United States has distinct policies as regards the Caribbean area, Mexico, and South America, yet the department of the government charged with the enunciation and clarification of foreign policies has been hesitant and non-committal. The problem is more than one of confidence in the Latin Americas: it is a question of mutual understanding, and a differentiation of policies would facilitate understanding between the several countries. In truth, the citizenry of the United States has been slow in affecting an understanding of the Latin Americans: we have far to go in this direction.

The policies of the United States toward the Latin Americas are of vital concern to American producers. The products of the United States and the several countries are largely complementary. Although our products are not complementary to those of the Argentine and other South American countries, yet the policies which the United States has pursued have aroused suspicion and distrust. If the experience of certain European countries is paralleled, the breaking up of the large landed estates in Mexico, Brazil and other countries will reduce the agricultural products of these countries, restrict their export, and to that extent make available new potential markets for American agricultural products. Thus it behooves the exporters of these commodities to urge the cultivation of the good will of these countries, even though they constitute only potential markets for our agricultural surpluses.

### EFFECTS OF WORLD WAR

It has already been pointed out that for over a century Europe consumed more than sixty per cent of our agricultural surplus, that the war period was one of prosperity for American agriculture, and that high prices abroad stimulated production in this country. Such being true, American statesmen, at the close of the war, should have used the influence of the United States to strengthen those policies working for the restoration of Europe to its former position as the world's greatest industrial center, thereby restoring her purchasing power and enhancing the demand for American food and raw materials which would have compensated for the certain decline following the cessation of hostilities. Instead of official coöperation, our leaders, through the policies which they have adopted, have hindered the restoration of Europe and built up a feeling of antipathy by which Europe has proceeded to gauge all the policies of the United States.

Glancing over some of the details, we find that the United States insisted upon negotiating a separate treaty of peace with Germany. The American Treaty of Lausanne remains unratified. We have been impatient with European attempts to abolish the opium traffic: the withdrawal of the American delegates from the Opium Conferences did not advance our standing abroad. The Senate's reservations of adherence to the Statute of the Permanent Court of International Justice mirrored, in the eyes of Europe, a "holier-than-thou" attitude. Too, the curt refusal of President Coolidge to explain these reservations, or to participate in a general conference to be called by the interested powers for the clarification of the reservations, further demonstrated the self-complacency of the United States.

Numerous efforts have been made to reduce armaments, especially naval armaments, with little accomplishments. According to acute observers, this problem remains unsolved largely because of the obstreperous efforts and policy-bungling course which has been pursued by the United States. More recently attention has been centered upon the abolition of war as an instrument of national policy. In its initial stages it was regarded abroad as a partisan political smoke screen to divert attention from the major political issues. The recent battle in the Senate over the Kellogg pact, with the possibility of ratification with reservations or interpretations, further confirmed the suspicion with which it was initially regarded in Europe.

### AMERICAN POLICY IN THE ORIENT

There remains the Soviet Republic of which the United States has refused to take official cognizance although it has functioned as the government in Russia for the past decade. Forced out of Europe, the Soviet government has allied itself with Asia. Recent activities of this country in China have been a matter of much concern to other powers, especially Great Britain. What Russia does is of importance to American producers, especially wheat growers, because she furnishes large quantities of grain to industrialized Europe.

The United States has pursued a slightly different policy in the Orient. In recognizing the Nationalist forces last July the United States did much to restore stable conditions in that country. In recent years the textile industry has made rapid strides in China and Japan. With the resumption of trade relations with China, these two countries offer virgin fields for the sale of American cotton. This should not be lost sight of in our future dealings with these two countries.

### Relation to Farm Relief

What is the relation of such policies to the American farm problem? In Europe they have had a two-fold effect. In the first place these policies have retarded the recovery of Europe and thereby reduced their purchasing power. In the second place they have caused an increased emphasis to be placed upon military preparedness and thus have drawn capital into non-productive fields. Both have operated to reduce the demand for our agricultural surpluses, so that the domestic market has remained glutted.

Is there any reason why the farm groups should not insist that their interests be given greater consideration in the framing of American foreign policies? Are not markets made, developed and captured? Is not consumption tied up with purchasing power? Is not international trade based on confidence, understanding and good will? It appears so. Then would it not be better to gain the confidence rather than the distrust of foreign powers, especially our southern neighbors? Would it not be good business, if not common sense, for the United States to coöperate officially with Europe rather than "unofficially"?

# Agricultural Aid in Czechoslovakia

By Dr. Antonin Prokes
Section Councillor of the Czechoslovak Ministry of Agriculture

AGRICULTURAL production, in which, according to the latest census, 40 per cent of the population of Czechoslovakia is occupied, is the object of Government concern and aid. In addition, the budgets of independent (territorial, county and community) corporations include financial aid for the fostering of agricultural production.

The Ministry of Agriculture, whose most important concern, according to law, is Agriculture, carries in its budget, for the year 1929, 245,600,000 Czechoslovak crowns (33 crowns to the dollar). The appropriations for agricultural and forestry colleges are included in the budget of the Ministry of Education.

## Parcelled Large Estates

Besides this, a separate Government office, termed the "Land Office," is endowed with the powers of carrying out the land reform, that is, parcelling out of large estates among small farm holders. The owners of these parcelled large estates receive payment for the land, the value of which is fixed so that the small landowner can afford to buy the allotted land. Altogether 4,000,000 hectares of land (1 acre—0.404 hectares) were taken by the state, of which 1,278,000 hectares are arable lands; the rest, forests, pastures, ponds, etc. Up to the present time, 84¼ per cent of the farm lands and 38 per cent of the remaining land has been allotted. The forests are, for the most part, Government property, or will be apportioned to independent groups (county, community). Eighty per cent of the agricultural land was distributed to owners of small and medium-sized farms with full title to it. The rest of the land was allotted to the so-called "remainder farms" which belong to the former managers and renters of the parcelled estates, to production cooperative associations made up of laborers of the former estates, etc.

In addition, colonization farms or new colonies, 28 in all, were founded on these parcelled large estates. About 500,000 families in 7,000 villages have acquired land. (There are 17,000 villages in the Czechoslovak Republic.) For the establishment of the new colonies the Government granted a loan of 160,000,000 Czechoslovak crowns. Thirty-six million Czechoslovak crowns were conceded as a state loan to the leasing coöperative production associations for the cultivation of the land.

The tenancy, maintenance, investment and colonization appropriations afforded those who were allotted land, amounts to the sum of 500,000,000 Czechoslovak crowns.

It is evident from these facts that with the Land Reform, the government fulfilled a service to society.

## Activities of the Ministry of Agriculture

The activity of the Ministry of Agriculture includes:

1. The care for the farmer, his education, the organization and insuring of his work.
2. The technique of agriculture and electrification as a means of increasing production.

3. Bettering plant and animal production.
4. The valuation, the turning into money, and safeguarding of agricultural production.

Besides these duties, the Ministry of Agriculture administers widespread state forests, large farms and industrial enterprises.

The Ministry of Agriculture carries on the afore-mentioned aims with the direct aid of its special offices all over the country, or by means of interested corporations, particularly agricultural advisory boards. These agricultural advisory boards, employing only specialists, provide for the fostering of plant and animal production, the organization of practical experiments, the bettering of breeding domesticated animals, expositions, surveys and sale of agricultural products, and the education of agricultural circles. Their power is only limited by the extent of their financial means which is apportioned by the Government and territorial administration. They have no revenue of their own.

Of the independent agricultural organizations, which are concerned in the development of agriculture, the cooperative associations stand out (main office is the Centrokooperativa): cooperative associations for sugar-beets, for distilling, for potatoes, chicory, forests, hops, fruits, for the breeding of various domestic animals, etc.

The "Agricultural Union" (Zemědělská Jednota), which manages large country-wide expositions and establishes relations between Czechoslovakian and foreign agriculture, and the scientific institution, "Czechoslovak Agricultural Academy" (Čsl. Zemědělská Akademie), also stand out.

The agricultural advisory councils and all agricultural corporations report their findings and proposals to the Ministry of Agriculture.

The following figures, taken from the budget for the year 1929, show the concern of the Ministry of Agriculture for agriculture:

50,000,000 Czechoslovak crowns for the purposes of spreading education in agricultural circles, for agricultural organizations and for the insuring of agricultural production.
90,000,000 Czechoslovak crowns for drainage.
78,000,000 Czechoslovak crowns for developing plant and animal production.
11,000,000 Czechoslovak crowns for the turning into money and safeguarding agricultural produce.

As has been said before, smaller amounts in territorial, county and community budgets, varying according to the wealth and according to the importance of agriculture in the district, are also used to the same purposes.

### ACCOMPLISHMENTS

The results of the work done by the Ministry of Agriculture during the ten years since the establishment of the Czechoslovak Republic (established October 28, 1918) are shown in these figures:

On the 28th of October, 1918, there existed 155 agricultural schools of varied standing and 26 "Folk" agricultural schools. Today, there are 261 agricultural and 740 "Folk" agricultural schools. The carrying on of this widespread educational program required extensive expenditures during the years 1919–1928:

About 4,000,000 Czechoslovak crowns for the instruction of teachers for the popular agricultural schools.
About 20,000,000 Czechoslovak crowns for building agricultural schools and experimental farms.
About 22,000,000 Czechoslovak crowns to aid private agricultural schools.
About 32,000,000 Czechoslovak crowns to equip these schools.

The Government itself supports fifty agricultural schools, and in six

additional schools the teaching groups are under state regulations.

The state maintains almost all research and experimental institutions and stations.

The spread of special instruction in the widest possible groups of population, the development of experimentation and the efforts to improve agriculture, to protect it from foreign competitions, are shown in the harvest results, in the increase in livestock, and in the increased animal production.

The comparative productiveness of one hectare of land in 1920, and the present, is shown by these figures:

| | *1920* | *Now* |
|---|---|---|
| 1 hectare winter wheat... | 11.3 q. | 17.2 q. |
| 1 " spring wheat... | 11.4 " | 16.9 " |
| 1 " rye..... | 9.4 " | 15.5 " |
| 1 " barley..... | 11.7 " | 18.1 " |
| 1 " oats..... | 10.8 " | 17.1 " |
| 1 " potatoes..... | 82.7 " | 141.5 " |
| 1 " sugar beet..... | 228.2 " | 276.4 " |

The numbers of livestock increased during the years between 1920–1925 as follows:

| | |
|---|---|
| Horses..... | 25.3 per cent |
| Cattle..... | 7.2 " " |
| Pigs..... | 24.0 " " |

The milk production also increased so that the supplies are sufficient for home consumption.

It is to be recalled, that during the war (1914–1918) Czechoslovak agriculture suffered very much because of military requisitions, lack of labor and means of production (fertilizers, seed, farming implements, etc.).

The work of competent authorities with a definite aim in view succeeded in repairing these war losses. The land reform, too, had a good effect on agricultural production, for by strengthening the position of small landowners, the increase in animal production is sure.

### FUTURE AIMS

The purpose of the Ministry of Agriculture is to attain a self-sufficiency in the production of breadstuffs (wheat). As for oats and barley, Czechoslovakia is not only self-sufficient, but can export large amounts of these cultivated products. Purposefully, they are working for the betterment of animal production, especially pigs, of which there is not a sufficient supply for home consumption.

The Ministry of Agriculture is lending aid to the necessary work of drainage (flood prevention, strengthening channels, amelioration, building aqueducts) and aids in the building of agricultural and cultural technical buildings, and in the consolidating of property.

They are working toward the building up of a protective tariff, especially in the animal production line, to protect the home agriculture and evaluate their production to compete with the countries where agriculture is extensively developed.

### LEGISLATIVE AID

To diminish the hazards in agricultural production, the Ministry of Agriculture has worked out a necessary bill concerning insurance against hailstorms and against the loss of livestock. The insurance rate, with the aid of the government, is to be low, so that it will be possible for the greatest number of farmers to carry it. The result of this proposed law will be far-reaching, for the losses each year, because of these uncontrollable natural causes, amount to 500,000,000 Czechoslovak crowns.

# Aid to German Agriculture

By Dr. R. E. Bose

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Translated by Karl Scholz, Ph.D., University of Pennsylvania

THE agricultural crisis is not merely causing serious concern to German enterprise, it is a burning problem also in other countries engaged in agriculture. The particularly unfavorable economic conditions under which Germany is at present compelled to live have contributed to make the agricultural crisis in Germany assume especially alarming aspects. One of the main reasons for the general crisis is the disparity between the prices realized on agricultural products and the prices which the farmer has to pay for equipment and household necessities, a disparity which makes the profitability of agriculture doubtful in all countries, if it has not been destroyed already. Even though the causes which have contributed to this disparity cannot be the same in individual countries, in view of different conditions, nevertheless, they reveal certain fundamentally similar characteristics. It is therefore only natural that the methods of procedure adopted in individual countries to overcome the crisis show certain parallels. The measures which have been introduced in various countries to relieve the difficulties of agriculture thus properly attain international interest. Every nation will follow the course of events in other countries attentively, and will endeavor to discover in time the trend in the development of conditions, in order to profit for itself, as far as possible, by the experience of other countries.

If, in the following pages, I speak of the distress of German agriculture, and of German efforts to remove it, I must say in advance that, in view of the available space, it is obviously impossible to treat exhaustively all the problems pertaining to the German agricultural crisis. I must rather limit myself by stressing several cardinal points, and show in analyzing them the courses employed in Germany thus far to relieve the needs of agriculture. In particular it would lead too far afield to discuss the various measures of a commercial, fiscal, and social political nature, which are of interest in this connection. No matter how significant they may be in general for overcoming the crisis, I believe, nevertheless, I can refrain from discussing them, all the more so since they are concerned with measures which affect not merely agricultural, but economic activity in general, and which in the final analysis have not been brought about by the present acute crisis.

## Collapse of Agricultural Activity

The enormous post-war increase in debts is significant for German agriculture, after a certain relief from debt burden had been brought to agriculture as a result of currency depreciation. We are here dealing with phenomena which affected the large landowner as well as the small operator. In looking for reasons, we should remember, in the first place, how extensively agriculture had to bear the burden of the Rentenbank, which formed the basis for the issue of the Rentenmark, and thus for the stabilization of the German currency. In addition, the value of the agricultural inventory had declined during the period of controlled industry. Agricultural activity, apparently

flourishing during the period of inflation, had in reality worked with deficits, and inflation had consumed all the working capital. After the stabilization of currency, agriculture was suddenly confronted with the necessity of providing for taxes, social burdens, funds needed for intensified production, and current expenses in terms of gold marks. With the general capital impoverishment in Germany, the requisite funds were obtainable only at prohibitive interest rates, and with considerable discount losses. The receipts in subsequent years, diminished by poor crops and unfavorable prices, were insufficient to raise the enormous interest charges, in addition to the high fees and social burdens. Thus the debt grew continuously, because of arrears in interest, unprofitable expenditures to intensify production, and new taxes obtained by way of credits. An unusually large part of this debt consisted of short time obligations, but no funds were available to make payments of sums falling due from time to time out of current revenue, or to convert debts into long time real estate loans. Ever recurring new maturities of irredeemable obligations made the orderly conduct of business impossible, and seriously endangered all agricultural production. Even greater was the danger arising from the high interest burden on interest bearing debts. In numerous instances it could not be met, because of the much higher taxes and social burdens than in pre-war times. In many cases, the indebtedness, including that of enterprises particularly important to production, gradually rose to a point in excess of the loan limit set for first class real estate loans. To obtain long time real estate credits in excess of the loan limits was impossible. It was therefore well-nigh hopeless to provide new credits for agriculture. The impossibility of repaying the floating debts at maturity, or even of paying interest on them, threatened the gradual collapse of agricultural activity.

### GOVERNMENT AID

In this situation the Federal Government intervened. It undertook the task of converting the burdensome and high interest bearing short time obligations of industry into long time real estate credits. Haste was necessary in order to rescue the encumbered industry before the collapse. Permanent relief could, of course, not be afforded by such a measure. Permanent relief can be brought about only by the restoration of the profitability of agriculture. But this presupposes the restoration of the freedom of action of the hard pressed farmers necessary for more intensive production, by relieving them of the burden of their debts.

To carry out the proposed debt conversion, it was necessary in the first place to provide prior lien loan funds, particularly mortgage loans, in addition to long time credits, in order that enterprises might realize long-time loan capital, beyond the loan limits set by the mortgage loan institutions, to relieve themselves of particularly pressing obligations. Domestic funds were not to be had. Therefore nothing remained but to have recourse to the foreign capital market. But since it was also impossible to obtain funds on second rate security abroad, only credit institutions supported by public organizations could become bearers of a foreign loan. In the nature of things, municipal establishments were given first consideration. Thus, the well-known conversion loan of the leading municipal credit institution, the German Land Banks' Central, yielded over $25,000,000. Until the loan had been floated, the required funds were advanced to the credit institutions by the Reich

(Federal Government). Detailed provisions as to the distribution of individual credits have been issued by the Reich and the states intended to assure appropriate use of the available funds. The chief consideration in distribution was the idea of so fixing the loan limit as to make second rate securities still possess a real equity. Furthermore, credits were to be extended only to those farmers who gave satisfactory assurance of reasonable continuation of their enterprises. Whenever small farmers and farm-tenants could not give mortgage security for the conversion of credits, other forms of loans had to be arranged.

### UNFAVORABLE MARKET CONDITIONS

It has previously been mentioned that this credit action was intended merely as a first step in the correction of the deficit situation in agriculture. Obviously the general indebtedness, because of the compulsory marketing of products, which it necessitated, caused a profound depression in price. The decisive difficulties, which stood in the way of rationalizing agriculture,[1] were consequently not removed. Now it was rather a question of attacking with might and main the unfavorable market conditions. All measures, which were to be undertaken for this purpose, obviously had to take into consideration the position of agriculture in the national economy. In spite of all efforts toward rationalization[1] and intensification, agriculture can never share entirely the advantages of industrial large scale production. It remains dependent upon condition and structure of soil, upon weather and climate. Above all it lacks the necessary intimate touch with consumers which is afforded by a survey of market conditions and of price determinants. Nor is the farmer able to adapt the extent of his production to the actual price level. On account of the perishable nature of his products, he is compelled to sell his crop shortly after harvesting it, especially since he is in urgent need of the resultant funds in the subsequent crop period. Existing conditions of production also prevent his being reimbursed for his higher interest burden by possibly decreasing the period of turnover of his working capital. They compel him to invest relatively more capital in his business than is necessary in industry. The peculiarity of circumstances affords only little opportunity to the farmer to influence fixation of prices by combination in the manner of cartels,[2] and thus to shift interest and other burdens on to the consumer. He must, moreover, market his product at wholesale prices, but has to pay for his necessities the retail prices of an organized, and cartelized industry.

These obstacles confronting agriculture in the general economic struggle must be decreased wherever possible. Agriculture, therefore, at least had to attempt to apply the particularly beneficial methods of industrial large scale production, as far as possible, to agricultural conditions. To accomplish this it was first necessary to organize production, and in connection therewith to standardize the methods of production of individual products. It meant producing only first class standard products. On the other hand, it necessitated the development of a most extensive marketing organization, and, wherever possible, the promotion of a coöperative combination of agriculture. Cartelization of agriculture, which has often been urged, and recommended as a cure-all, is impractical. It is, moreover, foreign to agriculture, and has, therefore, rightly met with opposition in Germany.

[1] Scientific Organization.

[2] Selling Organizations.

### PRODUCTION AND QUALITY

The main task of promoting production and of improving quality will naturally have to be left to the solution of agriculture itself—of the producers and privately managed agricultural agencies. It is the function of the state to assist in achieving this objective. The first prerequisite for all progress in this direction is a reasonably good professional training of the farmer himself and of his personnel. For this reason especial attention has been given to agricultural extension and advisory courses by the Reich and the states. Scientific research work has received a new stimulus by virtue of the reorganization of the Federal Institute for Agricultural Technique. Major projects for promotion of production are the relief measures for the improvement and the technical reorganization of the dairy industry. The carrying out of both activities centered about the thought of attracting the aid of as much capital as possible with the available means. Since the issuing of loans, even out of public funds, was hardly possible, because of the large sums involved, and since loans could be obtained in the public money markets, only at interest rates prohibitive to agriculture, the interest rates were to be reduced with the aid of public funds to a figure bearable by agriculture. In this manner it was hoped to stimulate private initiative, and to make considerable sums of capital available for the cause.

In the field of amelioration activity, the available funds were employed to lower the interests rates on loans for agricultural soil improvements (irrigation and surface drainage, under-drainage, irrigation ditches, field enclosures, etc.), the plans for which had been examined officially from technical and agricultural viewpoints, whose profitability seemed assured, and the execution and up-keep of which were under public supervision.

In the foregoing manner the dairies were provided with plants and equipment for the improvement of milk production, milk transportation, and preparation of milk products. In particular it was now possible to proceed with the erection of cold storage plants and creameries, with the provision of establishments for fresh milk certification and preparation, and with the improvement of machine equipment of existing establishments.

Furthermore, various measures for the improvement of production were adopted in the field of poultry raising and truck farming.

Accelerated production is obviously limited by the ability of markets to absorb the product. Particular attention must, therefore, be given to market conditions. By lowering production costs, and at the same time improving quality of product, agriculture must seek to enlarge its market. Stability in the delivery of uniformly high-valued products is a prerequisite for extension of markets. The indispensable coöperation of trade for this purpose must be facilitated by adapting production to the forms of a rationally functioning trade. For this reason, also, the development must follow along lines of standardization of agricultural products as far as possible. Even though in Germany, as has been the case in other countries, efforts toward standardization were not supported by legal measures, one has come to recognize, nevertheless, the significance of standardization of agricultural production. All efforts in this direction thus find official support, but it cannot be denied that climatic and geographic factors are not particularly favorable to general standardization of agricultural production in Germany.

### PRICE FLUCTUATIONS

Mention of the efforts toward standardization has already touched upon the problem of market organization. A balance had to be struck between the widely fluctuating supply, on account of the different degrees of perishability, and the variable quality of product, on the one hand, and the requirements of the consumer, for uniform delivery of marketable products, on the other hand. Measures adopted in this direction naturally had to differ for different kinds of agricultural products. Their common objective was to remove severe price fluctuations, to free agriculture of constant price pressure, to make possible calm and uniform calculations, and thus to decrease the disparity between producer's and consumer's prices.

I may briefly summarize below the manner and the direction in which Germany devised measures for this purpose.

The continuous decline in the prices of hogs, which finally sank considerably below production costs, had resulted in enormous losses to German agriculture, particularly to the small farmer. Constantly rapid price fluctuation in the cattle market had likewise reacted very unfavorably upon the cattle dealers. Therefore, organizing measures have been adopted, which are intended to adjust the delivery at the cattle markets to their capacity more than heretofore, and so to divert a possible surplus supply in time or to keep it away at the outset. With reference to details, I may refer to the numerous relevant publications.

In the field of milk and dairy products, the attempt is to be made to counteract the influences of seasonal fluctuations upon prices, by granting aid for new construction of warehouses, cold storage plants for butter, ripening houses for cheeses, etc. In connection herewith, the effort is made to unite existing marketing organizations in separate production areas into pooling exchanges, in order to insure continuous contact, to bring about equal distribution of product, and to diminish as far as possible mutual competition. The pooling exchanges will be charged especially with observing markets and with systematic dairy control. The combination of various pooling exchanges into a central exchange for the entire country is intended to perfect the structure and to assure unified coöperation of the exchanges.

In the field of egg marketing and poultry raising, the attempt is made to achieve collective supply by erecting and financially supporting egg marketing organizations. Aid is granted in such a manner that, for egg assembling and marketing coöperatives, which provide their own required capital, subsidies are granted which will make possible the lowering of the interest rate on these investments to a bearable level.

By establishing assembling, sorting and packing plants, production of fruit and vegetables is to be unified, and by establishing auction houses, marketing is to be facilitated. The erection of cold storage plants and of winter warehouses for winterkeeping fruit and vegetables is to make possible better apportionment of product over the period of consumption.

Potato culture, which is subject to violent crop fluctuations, is afforded possibilities of stabilization by granting aid for the construction of storage pits, by combining drying establishments into a sales organization for the purpose of financing drying and warehousing, as well as more suitable marketing. Similar provision is made for a common

purchasing organization for the starch industry. Finally, measures are to be adopted to regulate the large price-determining markets. Here an oversupply of potatoes is to be withdrawn from the market and diverted to marketing areas having favorable freight facilities.

Further measures are intended to promote utilization of certified seed with a view to facilitating the conversion of grain culture to grazing in those territories where agriculture is no longer profitable on account of altitude, as well as climatic and soil conditions. Other measures are intended to facilitate the marketing of breeding cattle, and to promote the marketing of horses in order thereby to support quality horse-breeding. State aid was also granted to inland fisheries in their effort to change their establishments from preparation of low-valued to high-valued products, and thus to widen their market. Finally it is intended to assure profitable prices to German tobacco culture by providing marketing organizations.

The above-mentioned market organizations are to be established on the coöperative basis. This fact alone bears witness of the importance of coöperatives in German agriculture. The effectiveness of our coöperatives is severely jeopardized by the disorganization which still prevails. Combination is here also the need of the hour. To bring it about considerable sums have been made available by the Reich and by the credit institutions participating primarily in the coöperative enterprises.

With few exceptions, the above-mentioned measures are the objectives of the Agricultural Emergency Program of the Federal Ministry for Food and Agriculture. Naturally this has been only a first step toward making agriculture profitable. Consequently it is intended to develop this emergency program into a long time production and market promotion program. The future must decide the rest. The lasting value of the Emergency Aid program lies in its directing relationship to German agricultural policy in recent years.

# Some National Policies Toward Agriculture

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NATIONAL policies designed to enlarge agricultural purchasing power through higher unit prices for farm products have arisen in several countries, and some of them in response to recent conditions.

The International Economic Conference held in Geneva in May, 1927, emphasized the importance of agriculture, "the occupation of the majority of workers throughout the world." The final report of this Conference points out that

> the economic depression in agriculture is characterized by the disequilibrium which has arisen between the prices of agricultural products and those of manufactured products,

and states that

> the diminution in the purchasing power of agricultural population has reacted upon industrial production and is consequently one of the causes of unemployment which in its turn reduces the outlets for agricultural products.

Representatives of England, France and Germany, members of the subcommittees on Agricultural Questions of the Preparatory Committee for the International Economic Conference, collected information for 18 countries, of which 14 were European. The object in compiling the statistics was to show the change from pre-war conditions in the power of marketed agricultural products to pay for costs of production and for the costs of articles of household use. A weighted average for the 18 countries indicated that in 1925–26 the purchasing power of marketed agricultural produce compared with working expenses was 90.5 per cent of 1913–14, and the purchasing power of agricultural produce sold compared with domestic consumption was 73.8 per cent of 1913–14. The decline in the power of farm products to pay for the labor and other items entering into their production was slightly less in the European countries than in the United States, being from 100 to 93.1 in the European areas, and from 100 to 91.4 in the United States. The decline in the power of marketed farm products to pay for items of domestic consumption was shown to be from 100 to 70.8 in the European group of countries and from 100 to 79.4 in the United States. It appears that the cost of purchased items of living is high to farmers of both Europe and the United States and that the cost of agricultural production, while relatively not so high as the cost of living, is impressive when measured in terms of the prices of farm products.

It would seem that the agricultural depression has had causes operating in several countries, though differing much from country to country. From the emphasis laid on tariff reduction, it appears that the conferees believed that tariffs on manufactured and other commodities were largely responsible. Among the conclusions reached by the Conference were the following:

> It is desirable that all hindrances to the free circulation of and trade in agricultural products should be removed in so far as their removal does not endanger the vital interests of the different countries and their workers:

and

> In those States in which customs protection is maintained, it should be reduced,

both for industry and agriculture, to the lowest possible point indispensable to production; care should be taken to assist in the maintenance of an equitable balance between industry and agriculture and not to stifle one to the advantage of the other.

Tariff level indices for the various countries were prepared for the same Conference, and 13 of the countries for which agricultural index numbers were prepared were covered in the tariff level study. Analysis reveals that among these 13 countries the agricultural depression had spread almost without respect to the height of tariff walls, and almost equally without respect to the extent to which manufacturing tariff rates exceeded those on agricultural products. A more extensive and more intensive study of the problem might, of course, justify the emphasis given to tariff reduction by the Geneva Conference. From the data thus far published, however, reduction of tariff rates, whatever may be their significance from the standpoint of the total economic situation, is not to be regarded as the sole cure for the maladjustment between agriculture and industry in all of the various countries. It is doubtful whether at the present time there is any more general influence tending to lower agricultural purchasing power in countries exporting farm staples than that resulting from the reduced supplies of monetary gold in European countries importing such staples. So long as exportable surpluses of both edible and other staple farm products from the United States must seek outlets primarily in these European countries, it is obvious that the effect of concentrating the gold supply in the United States could not be such as to inflate the United States prices of the products of export branches of agriculture, but rather, compared with United States prices in general, to keep them small. The fact that agricultural purchasing powers as well as prices have been low in other countries as well as in the United States, however, indicates that during much of the past decade world supplies of the staple farm products, compared with world demands have been heavy. Clearly, the international approach to agricultural problems, if it is to go very far, must comprehend more than agreements as to gold supplies, which the Geneva Conference did not envisage, or agreements as to conditions incident to the systems of import duties and of export prohibitions and export duties against which, with the exception of taxes levied for the benefit of industries concerned, the Geneva Conference threw the weight of its opposition.

Apart from any primarily international aspect of the general agricultural situation, an examination of some methods by which individual nations have sought to redress the economic balance between agricultural products and other products is believed to be in order. This will be done here in summary form for England, France, Germany, Czechoslovakia and Sweden and for Australia, British Columbia and New Zealand.

## ENGLAND

Some phases of English history are especially interesting in any study of the relation of national policy to agricultural situations. One of these is the period of the Cavalier or Tory Parliament, 1660–79. The other is the period, 1920 to date.

Professor N. S. B. Gras has brought to light a section of an act of the 25th year of Charles II, passed in 1672–73, in which notation is made of the fact that "the labours of the husbandmen in raising corn and graine . . . is already at a very low rate." The low returns were especially distressing to Charles II, who desired to tax landowners

largely for military reasons. The grant of subsidy to the Crown was acquiesced in on the condition that

> every Merchant or other person who shall putt on Shipboard in English Shipping . . . any sorts of the corne . . . shall have for every quarter of Mault ground or unground two shillings and six pence, for every quarter of Rye ground or unground three shillings and six pence, for every quarter of Wheate ground or unground five Shillings.

The export premium thus afforded was to be available only when the prices "in any Port or Ports of this Kingdom or Dominion of Wales" were below certain minimum figures. In terms of hundredweights the price which admitted of the bounty and the amount of the bounty was as follows in dollars and cents:

| Product | Bounty Rate | When Under | Equivalent Percentages |
|---|---|---|---|
| Barley or malt | $0.10 | $0.96 | 10⅗% and over |
| Rye | 0.15⅗ | 1.28 | 12⅛% and over |
| Wheat | 0.24 | 1.92 | 12½% and over |

According to the accounts of the corn bounty payments the application of the bounty lay between the year 1674–75 (Michaelmas to Michaelmas) and the year 1680–81 (Michaelmas to Michaelmas), having been a year or more late in coming into effect owing to the high price of corn, but having been extended over about the same length of time as that specified in the act, that is, in all about five and one-quarter years.

The Whig Parliament in 1689, during the first year of William and Mary, readopted this agricultural export bounty system. This method of encouraging agriculture was reintroduced since, according to the preamble, it had been found by experience that the exportation of corn abroad, when the price at home was low, had been a great advantage not only to the owners of land but to the trade of the whole realm. The language of the experimental bounty of Charles II was carried into the better-known bounty measure which, with only minor modifications, remained on the statute books from 1689 to 1814. The passing of English and Welsh grain from the position of exportable surplus to that of alternate surplus and deficit during the period, 1765–92, and on to that of regular deficit during the following decades not only accounts for the action of the Parliament in repealing in 1814 the law providing for export bounties, but for the growing opposition to the bounty system from about the time of the French and Indian Wars, as evidenced in Smith's "Wealth of Nations (1776)" and other important treatises.

It was apparently upon the workability of the English bounties up to about 1765 that Alexander Hamilton based his recommendation for their use in the United States as incorporated in his Report on Manufactures which was laid before the First Congress in 1791.

After the repeal of the bounty provisions affecting agricultural exports, duties on agricultural imports were continued in force until 1869, when the last of the phases of the repeal of the corn laws had taken effect. The indisposition to raise import duties revealed in the report from the select committee of the House of Lords appointed to inquire into the state of agriculture in England and Wales,

Session of 1837, was followed by a disposition to leave unprotected the agriculture of the United Kingdom, except as sanitary and other regulations might have a protective effect.

The agricultural depression in present-day England is commanding attention on the part of the various interests. There is a fairly widespread belief that an under-emphasis has been laid on agriculture in the policies followed in recent years in England and Wales. As Professor C. D. Whetham points out, the tendency to seek a remedy through tenure changes, coöperative organizations and other avenues short of persistent and consistent national influence on credit and prices of agricultural products is not likely to be fortunate from the standpoint of results. Highly industrialized portions of the British Empire such as the United Kingdom countries, however, are not believed to be willing to submit to higher prices on foodstuffs even though the foodstuffs should come largely from overseas dominions of the same empire. The risks of throttled importation of foodstuffs from the dominions and from other countries in time of war seem not to be so impressive as the hardship resulting from higher peace-time costs of food. It is, of course, too soon to assume that the cheap-food policy of the last century will be abandoned in the United Kingdom, but it is equally too soon to assume that it will continue without substantial abatement. The significant thing is that the agricultural problems of the United Kingdom are being subjected to scrutiny from far-reaching points of view under the official auspices of the Ministry of Agriculture and Fisheries.

## FRANCE

In his volume entitled "The History of the Grain Trade in France, 1400–1710," Professor Usher, of Harvard University, calls attention to the liberalization of export policy as affecting agriculture in France during the sixteenth century. The underlying intention was to encourage export when harvests were good, and to prohibit exportation when there was danger of dearth. Export licenses were frequently made available as a mode of taxation. France was not characteristically a grain-exporting country. Brittany, Languedoc, Aunis, Picardy, and Normandy sent grain to foreign countries, but only in the case of Brittany, Languedoc, and Aunis was the grain a staple export. Permission to export was a source of fiscal benefit to provinces or other political areas having exportable surpluses.

Actual stimulus of exports came at a later date, and is described in especially available form by Professor Josef Gruntzel, of the Welthandelshochschule, Vienna, in his "Economic Protectionism." So far as affecting agricultural products of the kind produced in the United States, French policy equalizing the position of exports may be said to begin in 1850. In explaining the origin of negotiable import certificates which were then first applied as export bounties, Professor Gruntzel points out that the business of manufacture in bond which had been inaugurated in 1828 was given advantages in the edicts of January 14 and June 1, 1850, by eliminating the requirement of proof of identity and dropping the limitation requiring exportation to take place through the same customs office. The southern provinces, dependent upon the importation of grain, then secured their imports duty-free through sale of the certificates in the flour-exporting northern provinces.

For a period of about 40 years beginning toward the close of 1873, the

use of importation certificates was confined to such limits as virtually to withdraw the export bounty feature. Writing for publication in 1916, Gruntzel says:

> In recent years the trade in import certificates has again been admitted. At present the millers in the North export flour made from domestic grain and sell the import certificates in Marseilles, where flour made from foreign grain can be advantageously sold at home.

### GERMANY

The policy of Germany likewise was developed so as to attempt under the tariff system a sort of internal or intercommodity reciprocity. As pointed out by Gruntzel in the same study, 1916, the different districts within Germany have been interested in the commerce in grain in very different ways. To quote:

> The northeastern Prussian provinces produce a surplus which, by the aid of cheap freights by water, they can market more advantageously in England than in the more remote consumption centers of Germany, while Russia and Austria-Hungary afford a more convenient source of supply for the industrial section of middle and southern Germany. In the years 1887 and 1888, therefore, the landlords began agitating a demand for the issue of import certificates (Einfuhrscheine). In view of the fact that the question related to an extension of elaborative industry, they demanded abolition of the requirement of proof of identity. In the law of April 14, 1894, the desired change was introduced, and it has been retained in the tariff law of December 25, 1902. By the terms of the law, on the exportation of wheat, rye, spelt, oats, buckwheat, legumes, hops, rape and beet-seed, and when the amount exported is at least 500 kilograms (1102.3 pounds), certificates are issued which entitle the holder to import duty-free a corresponding quantity of the same commodity, within an interval to be fixed by the Bundesrat, but in no case to exceed six months. As a further extension of this traffic, the proprietors of grinding and roller mills, to whom the privilege of manufacture in bond had already been granted in the tariff law of July 15, 1879, and also the proprietors of oil mills, likewise received permission to use import certificates. They were given certificates on exportation of manufactured goods produced by themselves within the customs domain, issued on the basis of the amount of raw material embodied in the products, and subject to the provision that this amount must be not less than 500 kilograms. The yield-ratio fixed in the exportation requirements is in the case of rye-flour, 75 per cent, of barley-malt, 75 per cent, and of wheat-malt, 78 per cent. The Bundesrat was further authorized to permit the acceptance of these import certificates in payment for duties on goods other than grains and legumes, and the permission was in fact granted in the case of a series of articles subject to purely revenue duties, including coffee, cocoa, tea, spices, tropical fruits, olives, rice, herring, petroleum, etc. The immediate effect was that the prices of grain in those parts of the country which depend on exportation for their market and which formerly had to contend with depressed prices, rose to a point higher than the general world-market price by approximately the amount of the import duty.

In articles entitled "The German Tariff and the Drawback System," and "A Review of the German Grain Import Certificate System," in *Foreign Crops and Markets*, for March 29 and June 28, 1926, representatives of the United States Department of Agriculture at Berlin made reports bearing upon the readoption of the import certificate plan, or compensatory trade and drawback system which was recently restored with some modifications by the new German tariff act which became effective on October 1, 1925. "Under the system, as now reëstablished, these students point out, exporters of rye, wheat, spelt, barley, oats and pulse in quantities exceeding

500 kilograms will, upon application, be supplied with an import certificate (Einfuhrachein) which entitles the holder to import within a period of nine months any of the products above enumerated equal to the customs value of the import certificate without the payment of duty.

"In the eighties, when German agriculture was in the throes of a severe agricultural depression, an extension of the (protective) system was demanded by the agricultural interests. At first the attempt was made to satisfy the agrarian interests by reducing the railway freight rates, but this proved unpopular in western Germany, both with traders and with local growers.

"The wave of reaction against the agrarians during the period immediately preceding the (World) War brought with it some radical changes in the system of import certificates. Following an official inquiry in 1910, the validity of these certificates was restricted to three months instead of six, and their availability for duty-paying purposes was definitely limited to agricultural products.

"After the outbreak of the World War the agricultural tariffs and the import certificate system were done away with.

"The purpose of the import certificate was to correct the faults which had become apparent under the German tariff system since 1879. The import certificate is a certificate with money value and can be sold or exchanged without any formality. The import certificate system always becomes an export stimulus when, after taking into account transportation costs, the domestic price is below the world market price plus the tariff. The import certificate system is a free-trade measure. . . . Since each export must be covered by an import, the whole transaction is really an exchange. The import certificate is part of the tariff system and is meant to add to its completeness."

During the two calendar years, 1926 and 1927, the metric tonnage of German farm products exported with benefit of import certification was 7,451,000 and 3,585,000, or 92 per cent and 86 per cent respectively, of all exports of the kinds designated as certifiable. The 11,036,000 metric tons of product given certificate exit from Germany during the two years was apportioned as follows: rye, 4,004,000; wheat, 3,623,000; oats, 2,184,000; barley, 81,000; rye flour, 375,000; wheat flour, 391,000; grits, groats, etc., 167,000; and rolled oats and rice, 211,000.

This leaves out of account the spelt and legumes to which the import certificate system was likewise made applicable from October 1, 1925. The rates of duty in marks per metric ton of these products are as follows: rye, oats and barley, 30; wheat and spelt, 35; beans for human consumption, 20; peas, lentils and legume feeds, 15; rye flour, wheat flour, and grits from grain, with the exception of oats, and rolled rice, 80; and rolled oats, 100.

The certificate system was extended to swine and swine products on April 1, 1928. The rate of duty on swine (live weight) is 145 marks per metric ton; on pork, except bacon, 210 marks; on bacon, 140 marks, and lard, 60 marks.

As in France, all provinces of Germany have not been on an export basis with respect to the products given the benefit of customs-waived replacement by the certificate method. Nevertheless, in Germany a longer list of farm products was given certificate exit in 1928 than ever before, although the list of articles subject to certificate entry was at its largest some 20 years before.

### CZECHOSLOVAKIA AND SWEDEN

The import certificate principle was applied in Czechoslovakia and Sweden under laws which went into effect on August 1, 1926. The Czechoslovak law of June 22, 1926, and the Swedish law of July 26, 1926, were both avowedly modeled on the German applications of the principle.

The import certificate provisions in the Czechoslovak law made up the second article of a measure, the first article of which established a new schedule of customs duties on selected farm products and their manufactures. The new rates of duty in crowns per 100 kilograms were as follows: wheat, maslin and spelt, 60; rye, 56; oats, 48; maize, 32; beans, peas and lentils, 36; vetch and lupines, 24; flour and milled products of grain (including rice) and legumes (rolled, ground, husked grain; grits and groats), 120; and rice unhusked, husked and broken, 36. Import certificates were authorized to be issued so as to entitle their possessors, within a period to be decided by law, and not exceeding nine months, to import, duty free, a quantity of one of the above-named commodities corresponding to the tariff value of the import certificates. The tariff value of the import certificates is determined by the quantity of commodities exported or the amount of their value as raw products, and by the lowest tariff rate prevailing for the particular species of grain or legumes in question.

Judging from the Czechoslovak experience of 1927, most of the certificates were issued against exports of oats, beans, flour used for feeding purposes and other mill products besides flour, the exports of these items being utilized almost entirely to secure import certificates. On the other hand, the duty-free imports made possible by these certificates include principally wheat, corn, rye, millet and rice. Such is the inference to be drawn from a report of August 13, 1928, from the office of the American Commercial Attaché at Prague.

The Swedish law (No. 382) added a system of import certificates (or export certificates, as consistently termed in the act itself) to the existing tariff structure applicable to wheat, rye, and wheat and rye flour at 3.70 and 6.50 crowns per 100 kilos for the unmilled and the milled product, respectively. Upon surrender of the certificate to the customs authorities the holder has the right within six months after the certificate is issued either (1) to import as much ground or unground wheat and rye free of duty as the certificate shows was previously shipped out of the country, or (2) take cash payment for its face value, minus 2 per cent, provided the amount of duty collected on imported wheat and rye during the six months is sufficient to cover such payments.

Opposed as early as 1911 by Professor Eli F. Heckscher and others, the agitation for an import certificate system was revived in 1923 and pushed with vigor in spite of opposition in the 1923, 1924 and 1925 sessions of the riksdag.

As a rule, during good crop years there is an exportable surplus of wheat and rye of certain qualities in Sweden, according to the report of the American Commercial Attaché. The principal wheat-raising provinces, Skane, Ostergotland and the Melare provinces (near Stockholm), thus frequently have grain to export. The price has been generally depressed during the fall months after the harvest when there are heavy offers on the markets from farmers who are not in a position to hold their surplus for better prices.

Both the Czechoslovak and the Swedish systems of import certificates

were established for an experimental period to expire July 31, 1928, but in neither case has there been a discontinuance.

The General Swedish Agricultural Society supported the proposal for import certificates at the same time that it was pushing a plan for a coöperative national wheat pool. The two procedures were regarded as mutually helpful.

### AUSTRALIA

In Australia there appears to have been an especially interesting application both of export bounties, and of centralized board or commission control of export marketing. Professor Reinhard Doenges, writing in 1902, cites the export bounties on sugar in some of the Australian states. The report of the Royal Commission on the sugar industry in 1920 reviews this experience, saying that there existed then in permanent statutory form a great actual measure of control by the State of Queensland, and a great potential measure of control by the states generally through their power of establishing price-fixing machinery. This Commission recommended the establishment of a general control by the Commonwealth over the cane sugar industry, to be exercised by a body called the Commonwealth Sugar Control.

Export bounties provided under Commonwealth laws by recent enactment in Australia include the following unprocessed and processed agricultural products: evaporated apples, 1918; beef and cattle, 1922; cattle, 1924; canned apricots, peaches, pears and pineapples, 1923. Under a system inaugurated in 1927 local factories were taxed to pay an export bounty. A tax of three cents a pound on butter consumed at home is levied so as to finance the payment of a bounty of six cents a pound on the butter exported.

Special interest attaches to the Australian experiments with centralized marketing under board control. The well-known British-Australian Wool Realization Association is omitted here in the interests of a description of some less well-known types. At least passing reference should also be made to the control boards instituted under two laws of October 20, 1924. One of these boards, the Dried Fruits Control Board, was authorized to control the export, sale and disposal overseas of dried currants, sultanas, and lexias, and was given power to impose a charge not exceeding one-eighth of a penny a pound on these dried fruits exported from Australia. The other board, the Dairy Produce Control Board, was authorized to control the export, sale and disposal overseas of butter and cheese, and an export charge not exceeding one-eighth of a penny a pound on butter and one-sixteenth of a penny a pound on cheese was authorized. The Dairy Board abandoned price-fixing as of April 30, 1927, but this is not taken to indicate complete abandonment of board control.

The wheat pools of Australia were originated by State action in order to meet the abnormal conditions of the trade during the war. So states the Report of the Committee on Stabilization of Agricultural Prices (British Ministry of Agriculture and Fisheries, 1925, Economic Series No. 2). The summary which follows is based almost entirely upon this report.

The original scheme was compulsory. It was entered into by the Governments of the Commonwealth, the States of New South Wales, Victoria, South Australia and Western Australia. The purpose was to sell to the best advantage the wheat crops of the respec-

tive States, and to make advances to farmers pending the realization. The scheme was applied to the 1915–16 crop and to succeeding crops up to that of 1920–21.

The duty of realizing the crop was placed in the hands of the Australian Wheat Board consisting of ministerial representatives of the Governments of the Commonwealth and the respective States, and one representative of the growers from each State. The Board was assisted by an Advisory Board, consisting of well-known wheat shippers, and the distribution of freights amongst the respective States was undertaken by the Wheat Board. As the United Kingdom was the chief export market for Australian wheat, and London the chief port, a London Wheat Committee, consisting of the High Commissioner, and the Agents-General of the States concerned, acting with the advice of the London representatives of the wheat shippers, arranged the overseas sales.

In each State a local board or commission controlled the operations of the scheme within its area, and the local board effected all local sales, including sales to millers. Agents of the State Governments were appointed to receive wheat on behalf of their respective boards, and these agents were usually merchants, millers or other authorized persons, having facilities for receiving, storing and shipping wheat, and were required to furnish adequate bond. On receipt of the wheat, the agent handed the shipping documents to the Minister, for transmission to the London Board or other overseas agents. Under arrangements with the Australian banks made by the Commonwealth and State Governments, advances were made to farmers upon delivery of their wheat at railway stations to the appointed representatives. The proceeds of the wheat sales were applied, as realized, in reduction of the bank overdrafts which had been used for the payment of advances and expenses.

In 1922 the compulsory pooling of wheat was abandoned, but the principle of pooling the exportable surplus was continued on a voluntary basis under the respective State Governments. Under this scheme, as in the case of the compulsory scheme, each State ultimately receives, in respect of the grain actually shipped, the average net profit from overseas sale, which after paying expenses is distributed *pro rata* among the growers.

"Under the latter scheme the organization for marketing the exportable wheat is roughly as follows:

"There are three wheat pools: (a) Victoria, (b) South Australia and New South Wales in conjunction, (c) Western Australia. Growers are free to dispose of their produce to the State pool of their own Government, or to that of another State Government or not, as they choose. In respect of each pool there is established a Wheat Board, analogous to the Australian Wheat Board referred to above, which is responsible for the purchase, collection, storage, financing, shipping and marketing of the grain. Under the Wheat Board an agent is appointed to purchase wheat from the growers making, on behalf of the Board, an advance for the wheat received of about 3 shillings per bushel. The agent receives the grain from the grower, usually in bags at the local railway station, and ships it to the port. These agents, who are mainly drawn from the principal firms engaged in the grain trade prior to the starting of the pooling system, are under State control, and are allocated certain districts from which they are authorized to collect wheat under the scheme.

"This system of pooling still remains in operation, and the grain ex-

ported to the United Kingdom is distributed there through the Australian Wheat Pools Agency, consisting of two firms, which receive and market the whole of the wheat exported by the respective Wheat Pools (with the exception of Victoria, which sells independently) operating upon the British corn exchanges, mostly in London."

Queensland provides what is perhaps the most remarkable example of the degree to which legislative support of centralized marketing has been carried. Queensland not only permits, but in certain circumstances compels, producers to market through a central association. Under the Primary Products Pools Act, 1922, provision is made for a compulsory pool for any agricultural commodity at the request of a specified number of growers of such commodity, with provision also for a poll to be taken on the question if such is demanded. Under this Act there have been constituted a cheese pool, an egg pool, a maize pool, and a pig pool, while a compulsory wheat pool under the Wheat Pool Act, 1920, has also been in operation. According to the "Survey of Agricultural Coöperation in the Empire," prepared by the Horace Plunkett Foundation, voluntary coöperation is in Queensland deemed to be an anachronism and quite out-of-date. It has time and again been demonstrated that a minority holding aloof from coöperative activity frustrates the endeavor of an organized majority. The value of loyalty under voluntary coöperation is not deemed to be in any way comparable to the security afforded by the compulsory system.

"Examples of the movement towards centralized marketing in Australia might be multiplied many times; notably in the case of dried fruit, poultry products, pigs and bacon, and other products great progress has been made. Sometimes these have been developed with State assistance, sometimes without; usually they have involved intermediate storage in warehouses or cold stores, and as in America, arrangements with the banks to finance these operations. But any examination of its recent development leaves little room for doubt that the movement in Australia has behind it a clear grasp of the economic object it is desired to attain. A prominent member of one of the Central Marketing Organizations was asked by us as to what he considered to be the real motive behind these developments in Australia. He replied: " 'Undoubtedly the object is to stabilize prices.' "

### BRITISH COLUMBIA

The British Columbia Legislature in March, 1927, passed a Marketing of Fruit and Other Farm Products Act that would secure complete marketing control of the 1927 tree-fruit crops. The bill was originally drawn to include dairy products, but the citizens of Vancouver, through their City Council and Board of Trade, declared that such a move would mean a monopoly for the big milk coöperative, and the measure was amended. This Act apparently is drawn to resemble certain Queensland legislation, one of its features being the authorization of a committee of direction of three members, one to be named by the coöperative growers, in other words, by the Associated Growers, Ltd., another by the independent shippers and growers, and the third, the chairman of the committee, by the Government. Provision was made that the entire cost of the Committee of Direction will be covered by a small levy against all packages of fruit and vegetables shipped.

In the language of *Farm and Dairy* for March 31, 1927, the act "removes the chief disadvantages under which the coöperatives have for so long la-

bored so that cash returns to all growers should be more nearly equalized than they have been in the past," and "provides that all shippers shall share in the cost of export, storage, and other features necessary to the market stabilization that, hitherto, have largely been borne by the coöperatives."

### NEW ZEALAND

Export bounties apparently have had no place whatever in the attempts at agricultural stabilization made in New Zealand. Disregarding the control developed in the case of the kauri-gum industry beginning in 1908, the main impetus to agricultural control boards has apparently come with the establishment of the Meat Producers Board in 1921. In 1924 a Poultry Act provided for the regulation of the export of poultry and eggs, and separate control boards for honey export, fruit export and dairy produce were authorized under special acts. The basic activity, however, is that of the Meat Producers Board. As described in the Report of the Committee on Stabilization of Agricultural Prices, an experiment analogous to the Australian Wheat Pools is being tried in the New Zealand meat trade.

In the autumn of 1921, when the price of New Zealand lamb reached the low point of 7 pence per pound ex store in London, a Statutory Board was set up to control the export of meat from New Zealand. The Board, which consists of five persons elected by the meat producers, two appointed by the Government, and one appointed to represent the stock and station agents, is given full powers to carry on the export trade and take over the freezing works. In practice it has not used its full powers, and has been content to supervise and regulate the marketing of meat in the interests of the producers. Its most important activities have been: (1) the control and inspection of the system of grading and marking, and (2) the regulation of shipments with the dual object of reducing costs and ensuring an even flow of supplies to the London market.

The following quotation from the Board's second annual report gives in a nutshell the aims of the organization and the means of attaining them:

> One of the most important duties undertaken by the Board since its inception has been the regulation of shipments, and it is one of the functions to which is given the most attention, as the Board fully recognizes that the regulation of supplies to the British market is one of the most important factors in stabilizing prices for our meat.
>
> The Board is aware of the difficult job it has undertaken in the feeding of the Home Market, but it also fully recognizes that it was about time that some controlling body with sufficient powers should take this duty in hand, for it is well known that in the past our meat was shipped in a very haphazard manner, and the market often glutted, with the consequent result of big fluctuations. Fluctuations are of no value to farmers. What they want is a steady stabilized market.
>
> The regulation of shipments, besides being in the direction of stabilizing prices, also tends to prevent big accumulations of meat getting into the hands of large holders. A glutted market with a limited demand enables speculators to operate and to take full advantage of the position.
>
> Compared with last season the Board, in regulating shipments this year, has not allowed more meat to go forward in any one month than the position warranted, and in arranging freights with the shipping companies, the greatest care has also been exercised to ensure that sufficient supplies are going forward to meet the demand.
>
> The regulation of shipments, besides being an advantage to the Home Trade, and a great gain to the Dominion, is also of immense value to the shipping companies, who are advised by the Board at regular intervals ahead as to the amount of tonnage required for each month. This places the

shipping companies in the position to work their vessels to the most economical advantage.

A writer in the *Round Table*, March, 1925, summarizes the situation in these terms:

> While much is expected from Control Boards in the way of stabilization of supply and price, still more is hoped for in the standardization of brands, the raising of quality, the cheapening of transport, commercial publicity, and the extension of markets.

## CONCLUSION

Centralized boards, whether using funds collected in the form of commodity taxes, or otherwise, have apparently served some useful functions in exporting countries such as Australia and New Zealand. In these countries, to be sure, domestic consumption has not been so large a relative factor as might be the case with products in the United States produced in exportable surplus. Otherwise, it would appear that well-established results of experience had in Australia and New Zealand might be useful in outlining a policy with reference to exportable products in the United States. In this experience one observes a tendency to set up practically separate boards for each of several farm commodities or types of commodities. It is possible that more attention might well be given in the United States to the suggestion which this conveys.

The export premium method apparently has applications no less recent than centralized marketing methods under Government control. Both cash bounty and certificate or customs-waived replacement types of export premiums are found, import-certificates being prominent in the recent experience of France, Germany, Czechoslovakia, and Sweden. The fact that a specific exportation can give a basis for duty remission on a subsequent specific importation seems well established. The replacement principle, used as a basis for export premiums, is suitable to rational application.

In the experience of the seven countries, there is nothing which has been established as proof that both methods may not coexist in the same country. That even in the case of the same product the existence of one method may be considered consistent with the application of the other method also is indicated by the demand in Germany for the revival of the German Grain Central to add still more support to the rye situation than that afforded by the certificate form of export premium already in force and regarded as effective within its limits.

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# Plans for Raising Prices of Farm Products by Government Action

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THE intent of this article is to analyze and compare the various plans that have been proposed in this country for raising the prices of farm products by Government action. The first of the suggestions of this sort were of the nature of simple crude price-fixing, no doubt suggested by the price-fixing activities of the Government in war time. They sprang up in the dark days of 1921–22, largely as emergency measures. They stopped coming partly because prices of farm products improved somewhat and partly because the authors came gradually to realize all their implications. Then came the McNary-Haugen plan, first introduced into Congress in January, 1924; then the Noyes excise-tax bounty plan, which never received much consideration; then the export debenture plan introduced into Congress in 1926 as the McKinley-Adkins Bill and later in 1928 as the Jones-Ketcham Bill. Dr. W. J. Spillman published his "limited debenture" plan in January, 1927. Mention must also be made of a domestic allotment plan with transferable rights, offered for consideration recently, and of the export bounty plan for butter now in force in Australia.

The intent of all of these is to raise the prices of farm products by making the tariff effective on products of which we have an export surplus. They differ from the valorization plans in use by other countries for coffee, rubber, sugar and sisal, in that there is no attempt at an export monopoly. None of these products is localized sufficiently within the boundaries of the United States to make an export monopoly feasible. Cotton represents the nearest approach to this.

Combined with the price-raising features of the two plans which have been introduced into Congress are provisions for loans to coöperatives, insurance against price decline, stabilization corporations to buy, store and sell farm products in order to prevent undue decline in prices in the marketing season, and other related features. In the last McNary-Haugen Bill, the term "equalization fee" was extended to cover assessments on producers to collect funds for orderly marketing. It is not the intent of this article to discuss any of the supplementary features of these plans.

## Operating Principles

*Equalization Fee Plans.*—The essential idea of the equalization fee plan is the raising of the price of the product in the domestic market by contracting with exporters to sell enough of the product abroad at world prices to make the tariff effective, and reimbursing exporters for the difference between their buying and selling prices out of funds collected from the producers in the form of an equalization fee. Since this fee is collected on all the crop, and losses are suffered only on the export part of it, it need be only a fraction of the import duty. The ratio of exports to the size of the crop will determine the size of this fraction. This can be illustrated in the case of wheat. If 200,000,000 bushels must be exported

out of an 800,000,000-bushel crop and a 600,000,000-bushel sale, the remaining 200,000,000 bushels being used as seed and feed, then 600,000,000 bushels must carry the loss on the 200,000,000 bushels sold abroad at a deficit of 42 cents a bushel, the existing tariff rate, or a total of $84,000,000. The amount of the equalization fee under these assumptions would be 14 cents per bushel, leaving the growers a gain of 28 cents per bushel, not allowing for costs of operation of the plan. The fee is to be collected on wheat exported as flour as well as upon wheat itself, and in the last McNary-Haugen Bill, on wheat and flour imports. In its later forms the plan provided for collecting the fee from exporters and millers, and transportation agencies if necessary. The amount of the fee must be announced in advance of the marketing season. Millers and other buyers of wheat would therefore reduce their bids by the amount of the equalization fee. The consumers would pay the full amount of the duty.

*The Export Debenture Plan.*—The essential principle of the export debenture plan is the paying of a bounty on farm products in the form of negotiable instruments called debentures which can be used by importers in paying import duties. The price of domestic farm products would be raised to the extent of the bounty; likewise prices to consumers. The revenues of the Government would be reduced by the amount of the export debentures issued. The maximum height of the export bounty is the import duty; otherwise a return-flow of the product would set in.

In the Jones-Ketcham Bill, the export debenture rates set up were one-half of the existing import duties, except in the case of tobacco, whose rate was 2 cents per pound for all types of tobacco, and in the case of cotton, whose rate was 2 cents per pound.

Professor Charles Stewart of the University of Illinois, who called this plan to the attention of Congress, obtained his suggestion for it from the import certificate plan in Germany, where it applies to products of which the country has a domestic deficit and upon which import duties are effective. The purpose of it is to offset the effects on the distribution of internal production of import duties. Before the duties were levied on wheat in Germany, the producers in eastern Germany exported their wheat through the Baltic ports and received Liverpool prices less costs of transportation. The millers in eastern Germany paid Holland prices plus costs of transportation. When the tariff duty was imposed, prices rose in western Germany by the full amount of the duty, but not so in eastern Germany. This situation was remedied by issuing import certificates on exports of wheat of eastern Germany, which were sold to the importers in western Germany. This had the effect of reëstablishing the former set of territorial price relationships within the country.

*The Excise-Tax Export-Bounty Plan.*—This plan was presented before the agricultural committees of Congress in the winter of 1926 by C. R. Noyes, at that time President of the St. Paul Civic and Commerce Association. Mr. Noyes' idea was to get his plan accepted by the Republican Party and thus save it from alienating the support of the agricultural interests in the Northwest. It probably was in connection with this plan that Vice-President Dawes became converted to the idea of assisting the farmers by some form of Government price-raising. The essential feature of the Noyes plan was to collect a sales tax from the farmers on all wheat, corn, hogs and

cattle sold by them and use the income thereof to pay an export bounty approximately equal to the tariff duty. The farmers were to pay the excise tax by purchasing tax receipts at the local post offices and delivering these with their product to the local buyers. All transportation agencies would be required to show these receipts along with their documents to a representative of the Internal Revenue Department stationed in the central markets before they could release the product for sale or storage. The price in the domestic market would rise the full amount of the export bounty, the farmers already having paid the tax. The net returns to the farmers would be the same as under the equalization fee plan, except for possible differences in costs of operation. The principal advantage claimed by Mr. Noyes was that having the Customs Service arrange the exporting by the simple device of paying a bounty on it was a simpler and more direct procedure than that set up in the McNary-Haugen plan.

*The Australian Butter Stabilization Plan.*—This is also known as the Paterson plan, after the name of its author, Mr. T. Paterson. It went into operation on January 1, 1926. It operates like the Noyes plan, except that the tax is collected from the creameries instead of from the farmers, and the bounty is paid to the exporters by the Stabilization Committee which has charge of the administration of the scheme. This procedure is possible because fully 90 per cent of the butter made in Australia is manufactured by coöperatives, and all of the coöperatives have combined to put the plan in operation. Creameries refusing to join the scheme are threatened with boycott by the farmers. The plan is essentially a coöperative monopoly, but it has been authorized by the Government, and in order to make it work successfully the Government has had to raise the duty on butter to 12 cents per pound, in order to keep out imports from New Zealand. Only about one-fifth of the butter production of Australia is exported. The bounty paid at first was 6 cents per pound. On January 1, 1929, it was raised to 9 cents per pound. The tax collected during the first year was 3 cents per pound, but 1 cent of this was afterward returned. It has raised the price of butter in Australia by the full amount of the export bounty.

*The Domestic Allotment Plans.*—The essential principle of the domestic allotment plans is paying producers a price plus the tariff duty for the part of the crop which is consumed in the United States, and a price less the tariff duty for the part of it that is exported, this to be arranged by a system of allotments to individual producers of rights to sell the domestic part of the crop in the domestic market. The object of this arrangement is to remove the stimulus to expansion of production involved in all of the foregoing plans. Any additional production which any grower undertook would have to be sold at the export price level.

Under Dr. Spillman's version of the plan, the device for raising prices is an export bounty and the funds for this are raised by requiring the local buyers of the product to buy "debentures," for the full amount of the bounty on all of the product purchased, from local agents of the "Commission" in charge of the plan. The rest of the funds collected are to be paid at the end of the year as a bonus to the individual farmers according to their allotments. It is Dr. Spillman's idea that the bounties paid will be something less than the import duty prevailing. The individual allotments are to the farms and not to the farmers, and are for an

unchangeable amount of product. He considers this necessary in order to prevent any expansion of production.

Under another version of this plan, no export bounty is paid, but the processors are required to show allotment rights or internal revenue stamps costing the full amount of the tariff duty for all product used in finished product sold in the domestic market. The individual allotments are to be issued before the planting season and in quantity something less than the domestic consumption. The processors will therefore always have to buy revenue stamps for some of their consumption. This will make the allotment rights always worth the amount of the tariff duty.

An essential feature of this second plan is the transferability of the allotment rights. The growers may discount them at a local bank as soon as they receive them and thus obtain an advance which may serve as production credit, or the growers may instead hold their rights until they deliver their product to the local buyer. The processors will procure the necessary supply of rights either when they purchase their grain or in the open market for them which will necessarily come into existence. There will thus be product moving through the channels of trade both with and without allotment rights attached, with price levels differing by the amount of the tariff duty. If the farmer has a crop failure, he will have his rights to sell and this will constitute some measure of insurance. If he does not care to grow any of the crop in any given year, he can sell his rights to others. This will make possible the shifting of crop production, which is impossible under Dr. Spillman's plan. The rights will be re-issued each year. Local buyers will make out receipts in triplicate when the product is delivered, one copy going to the grower and another to the allotment commission. These receipts will become the basis for not re-issuing rights if a grower does not produce any of the product for a few years, or for reducing the amount of them if his production is declining. The rights will be issued to the operator of the farm rather than to the farm, but jointly with the landlord in case of rented farms.

An earlier version of Dr. Spillman's plan required the local buyer to pay the grower the amount of the tariff duty on all the products he could show allotment rights for and to pay the commission the same amount on the rest, this latter to be used to pay an export bounty at the same rate. Under this arrangement the grower would have received his extra price upon delivery of his product, rather than as a bonus check at the end of the year.

Obviously, the most difficult feature of these plans is the determining of the individual allotments. One proposal calls for having county and township quotas determined by the Division of Crop and Livestock Estimates of the Department of Agriculture on the basis of township average acreages and yields obtained from Federal and State census records and also the records in its own files, and the making of individual allotments on the basis of assessors' annual reports where these are available, and otherwise on the basis of a special census which would cost about $100 per township, or on the basis of a registration which would be required of all farmers considering themselves entitled to an allotment. The allotment list would be published locally in tentative form in order to give anyone a chance to protest.

*Sales Tax Plan.*—The essential feature of this plan is collecting a tax from the processor for all products sold in the domestic market and paying this back to the producer as a bonus at the

end of the year, either on all of the product for which the farmer could show a sales receipt or on the basis of allotment rights issued him during the year. The exponents of this plan state that this is all any of the foregoing plans amount to, and the more simply it can be arranged the better. Nothing more will be said about this plan.

### DETAILED COMPARISON

Under the second domestic allotment plan the grower will receive his extra price at the beginning of the planting season so that it may serve as a partial advance of production costs. Under the equalization fee, export debenture and Noyes and Paterson plans, the farmer will get his extra price when he delivers his product; under the Spillman plan, as a bonus at the end of the year. The first plan is clearly superior to the others as to this feature. There are pronounced psychological and other objections to the payment of a bonus at the end of a year.

Under the equalization fee plan, the Australian and Noyes plans and the Spillman plan, it is necessary to estimate the amount of the probable exports in advance of the crop or production year in order to collect the necessary fees or taxes to pay it. This makes it necessary either to collect large fees in order to be safe and return the excess at the end of the year, or to build up a reserve.

Under the equalization fee and transferable rights plans, the producers must receive as extra price the amount of the import duty, less the deficiencies in price on the export part of production. Under the other plans it is the export bounty less the deficiences on the export part of the production, which determines the level of prices which the producers receive, and the export bounty can be for an amount less than the tariff duty. The first two plans are therefore more clearly designed simply to make the tariff effective.

The increase in price to the domestic consumers will be the extra price which the producers receive plus the tax or fee which goes to pay the export bounty in all cases, except with the export debenture plan, which draws upon the income from other imports to pay the export bounty.

All of these plans are able to finance themselves simply by adding the expenses of operation to the fee or tax, except the export debenture and transferable rights plans. The latter will provide its expenses of operation out of the sale of internal revenue stamps.

All of these plans, except the export debenture plan, require making collections on the product somewhere in the channels of trade, which is a pronounced disadvantage. The Noyes, Australian and equalization fee plans require collecting only the amount of the fee or tax, whereas the two domestic allotment plans require collecting the full amount of the increase in price, the one on all produce delivered, the other on that part of it which goes into domestic consumption. The Noyes plan proposes to collect from the growers themselves; the Australian plan from the growers' coöperative processing companies; the Spillman plan from the local buyers; and the fee and transferable rights plans from the processors and exporters. The larger the amount collected, the more incentive to evasion. Undoubtedly, collecting from processors and exporters is better than from farmers and local buyers.

The transferable rights plan will result in product moving through the channels of trade at two price levels, one domestic and the other export. This is ordinarily considered a disadvantage, but it would seem that the

distinction between these, one having rights attached, and the other not, would prevent any confusion and tendency for these price levels to merge. Under the export debenture plan the produce will move at one price, which will be the normal export price plus the amount of the export bounty. This will also be true of the Noyes and Australian plans. With an equalization fee plan in operation, the raw product will move in the channels of trade at a price including the tariff duty less the equalization fee. The manufactured product will include the amount of the fee.

The transferable rights plan would work out so that other farmers would be able to obtain the product for feed and seed and other farm and family uses at an export level of prices. One of the charges in the veto messages against the equalization fee plan was that it would penalize the farmers in deficit feed areas, particularly the dairy and poultry farmers in the East.

Although the export debenture plan would not raise the price to consumers, for the same amount of increase in price to producers, as far as would the other plans, the Federal Government would have to make up the loss in revenues resulting from it by some form of taxation, probably either income taxes or higher import duties. In its present state of mind, Congress would no doubt choose the latter procedure, which would leave the consumers no better off than under the equalization fee plan.

Taken by itself without any appendages, the export debenture plan would stimulate production the most. There seems to be little doubt that it would stimulate production. The argument is freely made that such a stimulus would have little effect if bounties were provided for all the major farm products, which is entirely possible under the export debenture plan. One answer is that export bounties could only be applied to crops of which there is an export surplus, and that it surely would have the effect of expanding the production of these at the expense of the others. A more important answer is that agricultural production as a whole would surely expand. The data of the Department of Agriculture indicate at least a 14 per cent increase in agricultural production since 1921. Our agriculture and world agriculture seems at present to be in the midst of another period of growth. The bounties provided in the Jones-Ketcham Bill would result in more intensive culture and heavier feeding of livestock on a great many of our farms, and in taking new land into farms or restoring a certain amount of abandoned land to farm use.

The equalization fee plan and the Noyes and Australian plans would have appreciably less effect on volume of production because equalization fees or taxes would rise somewhat as exports grew. Increasing our production from 800,000,000 to 1,000,000,000 bushels would increase the equalization fee by 7 cents per bushel; but it would still leave a bounty of 21 cents per bushel. A production of 1,200,000 bushels would leave a bounty of 17 cents per bushel.

The domestic allotment plans would undoubtedly stimulate the least expansion of production. This is the principal object of the system of individual allotments. Professor Stewart believes that the allotment scheme provided in Dr. Spillman's plan would not prevent expansion of production, for the reason that the individual farmers would plant enough acreage so as to be sure of getting the domestic premium on the full amount of their allotment in case of a short crop. No doubt there is some merit to this point, if the rights are not made transferable.

If they are, the farmer is free to sell his allotment rights and get his full share of the domestic premium, whether he has a short crop or not. On the other hand, it is probable that the advancing of some of the production costs made possible under this arrangement might induce the growers to buy more fertilizer and seed and hire more labor and thus expand production. It might also get the growers into the habit of considering their allotment of the product as properly standing all of the fixed costs, and balancing only the variable costs against the production for export, just as manufacturers in this country do under the protective tariff system. But expansion of production which takes place on this latter basis is not particularly objectionable from the standpoint of either individual or national economy.

Adequate checks on expansion of production can be set up under the export debenture plan. Those in the Jones-Ketcham Bill certainly do not qualify under this description. It would seem that the authors of it were either merely trying to protect their plan from criticism on this point, or else that they did not worry about possible expansion of production. If the export bounty were cut in half if the acreage of crop or production of livestock expanded 5 per cent in five years, there can be no doubt that the bounties would cease to operate as much of a stimulus. The Jones-Ketcham Bill permits 5 per cent in two years and then reduces the bounty by only a fourth. Five per cent in two years is equal to 25 per cent in ten years.

The last edition of the McNary-Haugen Bill had a provision which authorized the Federal Farm Board to withdraw the equalization fee rights whenever production expanded at an unreasonable rate. This provision has not been taken very seriously, probably because left in optional form. Mr. Henry Wallace believes that a Federal Farm Board, using the amount of intelligence that our Federal Reserve Board has exhibited, could use the foregoing authority in such a way as to control production effectively.

Neither the Noyes nor the Australian plan contains any provision for controlling the expansion of production other than that of the increase in the fee or tax that will result, but no doubt such a feature could be added to them.

Of course it is not necessary to assume that expansion of production is wrong. Increase in exports of farm products may be looked upon as very much to be desired. If the country has become too industrial and too little agricultural during the past twenty years as a result of subsidies to manufacturing, the positive method of rectifying this condition is to stimulate production of farm products by means of some scheme of export bounties. It is true that the new production thus brought into existence is somewhat uneconomical in the sense that it would not be profitable without a subsidy from the consumers, but in this respect it is not so much to be condemned as the new production which is encouraged by import bounties. Too large a production of those products at which we excel in production is better economy than too large a production of those at which we are at comparative disadvantage.

The lack of flexibility in the Spillman plan is a very serious criticism of it. With agriculture in a constant state of flux as in United States, as a result of the increasing use of machinery, substitution of gas power for horses, changing foreign competition, changing domestic consumption and the like, any plan which ties the producers to the same products as now is to be condemned. The transferable rights plan

very largely meets this sort of criticism by its provision for transfer of allotment rights. Even in this plan, however, some arrangement for revision of allotment rights seems needed. The revision need not be prompt, but it must come within several years of the change in production or the whole plan will become out-of-date. A system of vested rights would tend to grow up, which is contrary to the whole spirit of our institutions. The revisions must necessarily be made on the basis of past production. Farmers who have been growing more wheat for export for several years ought have their allotment rights increased, and those who have been shifting to other products ought have their allotment rights reduced. It is somewhat difficult, however, to provide for this without stimulating a certain amount of increase in production. Growers whose advantage is in shifting to other crops not covered by allotment rights will tend to continue their same acreage of present crops in order to retain their present allotment rights, and other farmers finding production of the crop in question profitable on the present basis will increase their acreage so as to get a larger allotment in some future re-issue.

Obviously, any one of these plans involves introducing an artificial element into the distribution of production. This will be especially true if the premiums apply to only a few of the products. If there is a complete schedule, as proposed in the Jones-Ketcham Bill, then it is not possible to get the various rates into a relation to each other which reflects relative economy of production; but this argument is also valid against a schedule of import duties.

If all of these plans were set up so as to make the export bounty equal to the import duty, they would work alike in the respect that the geographical structure of prices that would result would be the same as under a condition of free trade in the product, except at a higher level. The same would be essentially true of the price structure with respect to grades and types of product. Free exchange with foreign countries would set in so far as advantages of location and differences in quality and type of product are concerned. In general, the higher qualities of goods would tend to be imported and the poorer grades to be exported. The organization of trade which the German import certificate plan is intended to produce would develop in this country. There would be somewhat more foreign trade —both more imports and more exports. The volume of duties collected by the Government would increase somewhat. All of this has distinctive advantages from the standpoint of national economy. It saves considerable unnecessary hauling of commodities long distance behind tariff barriers, and also permits processors to obtain the grades and qualities of raw material which they need at less expense and with less difficulty.

But at the same time, although local prices will be higher at all points than before, they will not be as much higher in those areas where product is moving in from abroad to satisfy the needs of the local processors. The spread between high and low grades of product may be narrowed somewhat. No doubt there would at once develop a demand in the areas affected for exclusion of imports, and it might prove difficult to stem the tide of sentiment which arose. Our people are so much in the habit of looking upon importations of foreign goods however small as a menace, that they probably would not be able to readjust their thinking on the subject. If the demand became so insistent that it had to be met, the transferable rights plan could not be

adjusted to meet it so far as advantages of location are concerned.

So far as differences in types of product are concerned, setting up a schedule of tariff rates for the product, with rates varying according to the quality of the product, would be effective if it could be made to work. In the last McNary-Haugen Bill, all such importations were provided against by requiring that an equalization fee be collected on the imported product as well as on the domestic. Such imports are largely prevented under any export bounty plan in which the bounty rate is a considerable distance under the tariff duty. If imports were to set in, all that would be needed to check them would be to raise the tariff rate until it was as far above the domestic price level as before. This is what the Australians found it necessary to do.

So far as the effect on manufacturing is concerned, all of these plans permit the manufacturer to obtain his supply of raw materials on virtually the same basis as now. Unless the barriers mentioned at the end of the last paragraph were established, they would be better off in this respect than at present. The manufacturer for export will receive an export bounty on his product. The utilization ratios will prove something of a nuisance, sometimes resulting in slight profits and sometimes in slight losses; but in general they will prove a small source of profit if past experience with them is to be judged.

But in other important particulars, manufacturing will be at a disadvantage. First of all, the cost of living of factory workers will rise and their real wages decline. This will put the manufacturers at a disadvantage in foreign competition. In the second place, the higher prices at which their products will sell will curtail the consumption of them somewhat. While these effects are serious from the standpoint of the manufacturer, they are not necessarily wrong from the standpoint of national economy. If prices of farm products were where they should be today, with their purchasing power around 105 instead of 90, the manufacturers would be in exactly the position which the farm leaders contemplate establishing as a result of these price-raising plans. Any change in domestic conditions which puts agriculture in its proper position relative to industry will unavoidably have such an effect as the above on manufacturing. If agriculture is to stop its falling behind industry in this country at its present amazing rate, only some change which checks manufacturing in the foregoing manner can bring it to pass.

All the plans specifying a definite bounty rate are especially objectionable, since they furnish an easy basis upon which a foreign country may raise its import duties against the United States. Our own Government recently furnished an excellent example of how to do this when the Secretary of Treasury instructed the Collectors of Customs to raise the duty on butter from Australia by 3 more cents because of the increase of that amount in the export bounty under the Paterson plan. The equalization fee plan is little if any better in this respect. It would be easy for a foreign government to find out the amount of the deficits for which exporters received reimbursement. The Spillman plan designates a specific bounty rate, but in turn sets up a check on the expansion of production, and will be more acceptable to foreign countries for this reason. The transferable rights plan will be the most acceptable of all, because it not only furnishes very little stimulus to expand production, but also names no specific bounty rate. All the plans which work something like the German import certificate system have the ad-

vantage in foreign relations that they permit a certain amount of exchange for the purpose of taking advantage of location and difference in types of goods.

The export debenture plan requires the least additional machinery of administration, and the allotment plans the most. All of them set up some kind of a central board or commission, but with some of the plans this agency will have little to do so far as the price-raising activities alone are concerned. All but the equalization fee plan assign a considerable volume of additional work to the Treasury Department.

Evasion is a problem in all of the plans which involve collecting a fee or tax, or an addition to the price as in the case of the domestic allotment plans. This evasion may take either of two forms: one, collusion to avoid payment of taxes, such as might occur between a grower or a local buyer under the Spillman plan, or a processor and a dealer under the transferable rights or fee plans; and second, a certain amount of unreported local processing, such as might occur with pork and lard especially. Less than three-fourths of all the slaughtering in the United States is in inspected establishments at present. Any flour or pork sold beyond the reach of the revenue officials would escape paying an amount equal to the fee in the case of the McNary-Haugen plan, or an amount equal to the duty under the two allotment plans. This difficulty seems so serious in the case of pork and lard one surely would not advocate its application to them at present.

If one were to set up a composite scheme for raising the prices of the various farm products, it probably would include import duties on wool, sugar, flaxseed, beef cattle and possibly dairy products; the domestic allotment plan with transferable rights for wheat and cotton; and export debentures for pork and lard, poultry products, and possibly dairy products. The incomes from the duties collected on the first two list of products might well be used to pay the export bounties of the third. Rigorous checks on expansion of production would need to be provided along with the export debentures in order to keep foreign countries from tariff reprisals.

### GENERAL ASPECTS

None of these plans is price-fixing. They are all plans for raising the price of the product in the domestic market above the world level, just as tariff duties do. It is indeed appropriate that these various plans should take the tariff as their point of departure. The contention of the McNary-Haugen proponents that the time has come when Government subsidies must be extended to products exported, not restricted to those of which a nation has a domestic deficit, can be heard stated in various forms all over the world. Producers of export products everywhere are demanding that they be brought within the charmed circle. Consumers of these products object; but if they submit to taxes to pay import duties, they cannot logically revolt against similar impositions to help export products. Many economists object also, saying that these plans represent merely a further extension of mercantilism and interference with comparative advantage. If Government interference with production and trade is undesirable, the proper place to check it is not at the point where part of the producers have found a way of making it work successfully to their advantage. Let the system rest there for a while and it will presently become a fixed institution. No doubt the ideal procedure would be gradually to restrict the amount and scope of governmental interference. But the nation

has become so committed to the other policy that for the present the way of progress seems rather to extend the subsidies to the rest of the products as fast as plans can be worked out for doing it. Or even if it is not, the nation, and in fact the whole world, seems bent upon it; and the economist is largely out of a job if he does not take a hand in shaping these plans.

The charge of bureaucracy that has been leveled against these plans must not be taken too seriously. The export debenture plan invades no spheres of private enterprise not now invaded by the tariff system. Governments are regularly invading private affairs for the sake of raising funds to support public activities. A plan which involves no more extreme invasion than this can hardly be condemned, if the object is worthy of the effort required. Suppose one group of producers can be aided by a plan which involves little machinery, and another only by a plan requiring rather elaborate machinery, should the policy of the nation be to aid the first and not the second? Surely not. Instead it must decide to aid neither, or else develop the necessary machinery for the second. That is, unless there are important reasons of national welfare which make aid to the first a matter of great national concern. At present in the United States, the national concern is more largely with the latter.

The issue of constitutionality has been raised with respect to most of these plans. All students of public affairs agree that it is better policy to have the United States Government rather than the Attorney-General's office declare measures unconstitutional. It is appropriate for Congress to solicit the opinion of the Attorney-General's office on an issue of this kind. It is a mistake for Congress to pass an act which nearly all its members consider unconstitutional. If the measure is important to the welfare of the nation, and there is any reasonable chance that it will be found constitutional by the Supreme Court, then Congress owes it to the nation to pass it and let the Court decide. The President is under the same obligation. Anything else means that a strong majority opinion will occasionally be denied because of the negative opinion of a politically appointed cabinet officer and his legal assistants. It will mean in effect that the Supreme Court will have a chance to review only those measures which the Attorney-General's office considers constitutional.

There seems to be an honest difference of opinion among legal specialists as to the probable action of the Supreme Court with respect to the various price-raising plans. Granted no specific prohibitions in the way, a reasonable assumption is that the Court will consider proposals of this kind realistically, that is, in terms of analogies with the protective tariff system. The specific prohibitions that have been advanced are surely capable of being defined by a liberal court in such a way as to permit much of what these various plans propose. It may be highly worth while to discover what the present Supreme Court would permit along these lines, and the only way to find out is to pass an act and let them review it.

# The Relation of Annual Weather Surpluses to Net Farm Incomes

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ANNUAL crop surpluses due largely to the weather are constantly recurring, causing relatively low prices, calls for farm relief and discussion of what can be done to relieve the situation. This article is an attempt to analyze and illustrate the factors involved in this problem from an economic standpoint.

The term weather surplus is used here to include all variations in yields per acre due to uncontrollable circumstances. While some of the effects of climatic conditions, insect pests and plant diseases can be reduced by proper care and management, variations in yields tend to be only the net effect of the uncontrollable part of such factors. Variations in the future may be less than those of the past because of continued improvement in agricultural technique. For example, it is very unlikely that the boll weevil can again cause such extreme variations as in the past in the yields per acre of cotton.

The magnitude of weather surpluses and deficits can be indicated for specific crops by the amount of deviation in past yields from the trend in yield. If acreage were constant, the total variations in production would be equal to the variations in yield per acre. But some of the variations in yield are the long-time effects of improvements in varieties and cultural practices as well as the effects of the shifting, expanding, or centralizing of the productive area, to land less well or better adapted to the production of the crop. These constitute trends in yields which must be eliminated to arrive at annual variations. In this analysis, the trend in yields has been determined by fitting a free hand curve to the data for past years.

## Trend in Yield

Weather surpluses of animal products are small compared with crops. Those that do occur are in fact caused largely by the effect of weather and other uncontrollable factors on crops. Milk production, for example, declines when pastures become dried up; and hogs and beef cattle are sent to market at lighter weights when corn and other feed crops are small and their prices high.

Deviations in United States yield from normal trend of yield, drawn free hand, for wheat, corn, oats, cotton and potatoes for the last 42 years, are shown in Table I. They have been grouped into class intervals for convenience in presentation.

The significant fact about them is that during the past 42 years, yields were within 10 per cent of normal in 31 years for wheat acreage harvested, 28 years for cotton and corn, 25 years for oats and 23 years for potatoes. Corn showed the largest minus deviation in yield from trend, of 36.1 per cent in 1901, and potatoes the largest plus deviation, 32.5 per cent in 1895.

The yields per acre of wheat are for wheat acreage harvested. If wheat acreage planted had been used in calculating yields, the deviations from trend would have been much larger than those shown in Table I. This would not, however, affect fluctuations

TABLE I—PERCENTAGE DEVIATIONS FROM NORMAL YIELDS, 1886–1928

| Percentage Deviations | Number of years | | | | |
|---|---|---|---|---|---|
| | Wheat | Corn | Oats | Potatoes | Cotton |
| Above normal: | | | | | |
| 30–34.9 | 0 | 0 | 0 | 1 | 0 |
| 25–29.9 | 1 | 0 | 0 | 1 | 0 |
| 20–24.9 | 0 | 0 | 0 | 0 | 2 |
| 15–19.9 | 1 | 1 | 5 | 4 | 1 |
| 10–14.9 | 3 | 7 | 5 | 3 | 4 |
| 5– 9.9 | 8 | 7 | 6 | 6 | 6 |
| 0– 4.9 | 8 | 5 | 6 | 5 | 11 |
| Normal | 2 | 1 | 0 | 0 | 0 |
| Below Normal: | | | | | |
| 0– 4.9 | 6 | 8 | 4 | 8 | 4 |
| 5– 9.9 | 7 | 7 | 9 | 4 | 7 |
| 10–14.9 | 4 | 2 | 3 | 3 | 3 |
| 15–19.9 | 2 | 2 | 2 | 5 | 3 |
| 20–24.9 | 0 | 1 | 2 | 2 | 1 |
| 25–29.9 | 0 | 0 | 0 | 0 | 0 |
| 30–34.9 | 0 | 0 | 0 | 0 | 0 |
| 35–39.9 | 0 | 1 | 0 | 0 | 0 |
| Total number of years | 42 | 42 | 42 | 42 | 42 |

in total supply or its relation to prices, but would affect the relation of costs of production to yields.

The extent of weather surpluses and deficits for other crops could be calculated by the above method or with but slight modifications. In all cases there would be considerable variation in total production of individual crops due to uncontrollable circumstances. Since it is possible only slightly to reduce such variations by cultural practices, fluctuations in production cannot be controlled by controlling acreage.

The larger the area considered, the smaller the variations in yields, and consequently the smaller the relative weather surpluses. For a very small area, the yield may range from zero to a bumper crop. Even whole sections may have very large or very small yields. But for areas as large as the United States there are usually some sections that have favorable seasons while others have adverse conditions. If the whole world were considered as the production area, variations in yields would be quite small.

While the stability of average yields varies inversely with the size of the producing area, the relation of this yield to prices received by farmers is dependent to some extent on the perishability of the crop. When yields of cotton and wheat are large, more of the crop is held over until the following year than when yields are small. Such crops as potatoes and onions, however, can be stored for only a few months. Practically all of these crops are sold before the new crop is produced. With peaches, strawberries and many fruits and vegetables the marketing period is even more limited. The problem of weather surpluses consequently becomes most acute when the area supplying a given market is very small.

The supply of fresh fruits and vegetables, fresh milk and other products usually fluctuates much more widely on small local markets depending on local production than for markets drawing their supply from a much larger area. But large markets often draw their supply from small producing areas. Almost the whole supply for the United States of peaches, strawberries, lettuce and many other fruits and vegetables at particular seasons of the year is produced in very small areas. Weather surpluses are consequently a much more frequent and important problem for such areas and crops than for crops like potatoes and wheat.

The producing area for the potatoes sold on United States markets is much larger than for most fruits and vegetables. A normal crop in the United States may be the result of a bumper crop in the Great Lakes States and a very poor crop in the Northeastern States. If each area furnished the entire supply of particular markets, there would often be a surplus in the Great Lakes area and a deficit in the Northeast. But many of the commercial potato-producing regions ship their potatoes to the same markets. New York, Philadelphia, Washington and other cities receive their supply of potatoes from Maine, Michigan, Minnesota, Idaho and other distant potato-producing areas as well as from nearby states. The supply and prices on these markets are consequently closely related to the total production of potatoes in the United States. Areas with large yields often receive normal or fairly high prices with resulting large incomes per acre because of low yields in other areas. The areas with low yields may at the same time receive normal or not very high prices with resulting low incomes per acre because of high yields in other areas.

A bumper crop of wheat in Canada affects the world supply and world and United States prices in much the same manner as a bumper crop of potatoes in Maine affects United States potato supplies and prices. A large United States crop may bring high prices, as in 1924, because production in other parts of the world is small. On the other hand, a small United States crop may sell for low prices as in 1923. Low yields or weather deficits of wheat constitute a serious problem in place of weather surpluses. Stability of supply and prices is also accentuated by storage of wheat from one season to the next. Because of this stability of prices, farm incomes from wheat in the United States fluctuate much more widely than they would if prices were more closely related to current production.

### DEMAND AFFECTS PRICE

The width of a market for any commodity has much the same effect on demand that the extent of producing area has on supply. The wider the market for a product, the smaller the fluctuations in price for the same fluctuations in supply. Competing products often become a factor in small local markets. Weather conditions may cause a bumper crop of several of them.

Annual weather surpluses are also affected by changes in demand. The number of uses for a product may increase or decrease in a short period. Prohibition had some effect on demand for barley. The decrease in the number of horses is reducing the demand for oats. Business depressions may temporarily reduce the buying power of consumers and affect prices and returns to producers. On the other hand, weather deficits may change demand rather permanently. When some products become scarce, people have to get along without the usual amounts,

and soon form the habit of going without or using very little. When supplies become abundant again, people do not buy as large quantities at the same price because of habit, and prices fall lower than in previous periods. Quantities that were not considered large enough to be depressing surpluses in the past became so following one or two consecutive deficits.

The demand for certain products may also be changed materially by the development of new competing products, or a fuller realization of the value in certain products. Rayon or artificial silk is being used in place of cotton, and consumers are demanding larger and larger quantities of whole milk, fresh vegetables, and tropical fruits per person every year. In the case of food products, increased consumption of some products usually means a decrease in consumption of other products.

Durability is another important factor affecting demand and weather surpluses. Very short cotton crops for a few years may raise prices and increase the length of time cotton clothing and material are used. Perishable food products, on the other hand, cannot be held over from one season to the next, and when yields are high, prices are very low.

The demand for corn, oats and other feed crops is much more elastic than that for potatoes and wheat used for human food. A farmer does not hesitate to substitute barley or oats or cut down on the rations for hogs, horses and cows when prices of corn rise, but he would rather pay increased prices for wheat flour or potatoes than to cut his own rations or substitute barley flour and rice.

### SUPPLY-PRICE RELATIONSHIP

To show the relation of weather surpluses and deficits of yields to prices in the United States, one must first determine the relation of supply to price in the United States. Free-hand curves were fitted to total United States supplies and to annual average central market prices for the past 42 years. The deviations from the normal trend lines of supply were then plotted against the deviations from the trend of prices, and a free-hand supply-price curve fitted to the results. Such a supply-price curve will illustrate the economic principles involved in the relation of weather surpluses to prices as well as if it was calculated by more elaborate statistical methods, and besides it may be just as accurate. Central market prices rather than farm prices were used because they can be obtained for longer periods of time. In order to approximate the prices received by farmers, the average difference between average central market and farm prices 1908 to 1927 was subtracted from the estimated central market price. This does not, however, take account of any difference in the supply-farm-price curve from the supply-central-market price curve. This difference may be and probably is of some importance for potatoes. For the other crops, however, farm prices follow central market prices very closely.

In the case of wheat, the supply-price relationship was determined between world supply of wheat and Chicago prices. But since the United States production is only about one-fifth of the world supply, an increase of 10 per cent in United State production is equivalent to only a 2 per cent increase in world supply. The prices corresponding to variations in United States production were, therefore, read from the graphs as those corresponding to one-fifth of the amounts in variations in world supply.

The estimated quantities represent-

ing variations in supply of each crop were multiplied by the estimated farm price to show the approximate effect of weather surpluses on total gross value to farmers. The results expressed as value to farmers in terms of 1913 dollars are shown in Charts I to V.

With a normal acreage of corn, yields 10 per cent below normal would have the largest total value, while for cotton, yields 7 per cent below normal would have the maximum value. Wheat, on the other hand, increases in total value as yields increase. The total values of potatoes and oats apparently increase rather rapidly as the supply or yield decreases.

The relation of price per unit, or total gross value of a crop, to weather surpluses, is only one side of the picture from the farmer's standpoint. Weather surpluses affect costs of production as well as prices received for product. A large crop costs more to produce than a small crop, although the cost per unit may be less.

### PRODUCTION COSTS

Costs of production may be estimated in a large number of ways. In this article, however, it is assumed that the normal price, determined by fitting a free-hand trend to price data, equals normal costs of production of a normal yield per acre. The term cost is used here to include all of the rewards necessary to insure continuous attempts to produce the normal supply.

Normal prices or costs in terms of 1913 dollars were divided into two parts: fixed costs per acre, such as land rent, and fixed cost per bushel, such as threshing costs. These divisions are necessarily estimates, since accurate data are not available for making an accurate division of these costs. It was also assumed that such costs as for harvesting corn and potatoes and threshing wheat and oats would vary directly with yields.

The fixed costs per acre were then divided by normal yields and yields both above and below normal, to get them to a unit basis, and the results added to fixed costs per bushel to obtain total costs per unit for various yields. Total costs of production were then estimated by multiplying these per-unit costs by the same quantities used in estimating total value of crops of various sizes. These costs are shown in the above mentioned Charts I to V. They form in each case a straight line.

The closest relation between yields and costs per unit is shown by cotton. Large yields mean greatly increased cost of production. Total costs also rise somewhat rapidly with increasing yields of corn, but for oats, wheat and potatoes, there is very little relation between yields and total costs of production.

### GAINS AND LOSSES

We are now ready to consider the relation of weather surpluses to the gains and losses of farmers. A study of the following charts reveals that for crops with a limited market, farmers lose on weather surpluses and gain on weather deficits. The total value and total gains above costs for wheat increase as United States supply or yields increase with constant acreage. All of the other crops show losses as supply increases above normal. The gains represent additional money increases (clear profit) above costs while the losses are not entirely money losses, but rather simply reduced incomes and smaller rewards for labor and management.

A calculation was made to show the effect on returns of fixing prices at normal. As one would expect, it simply inverted the effect of weather surpluses. Whereas farmers now lose when yields of most crops are large; if prices were fixed, they would lose when

CHART I—RELATION OF UNITED STATES PRODUCTION OF WHEAT TO TOTAL FARM VALUE AND COSTS, IN MILLIONS OF 1913 DOLLARS

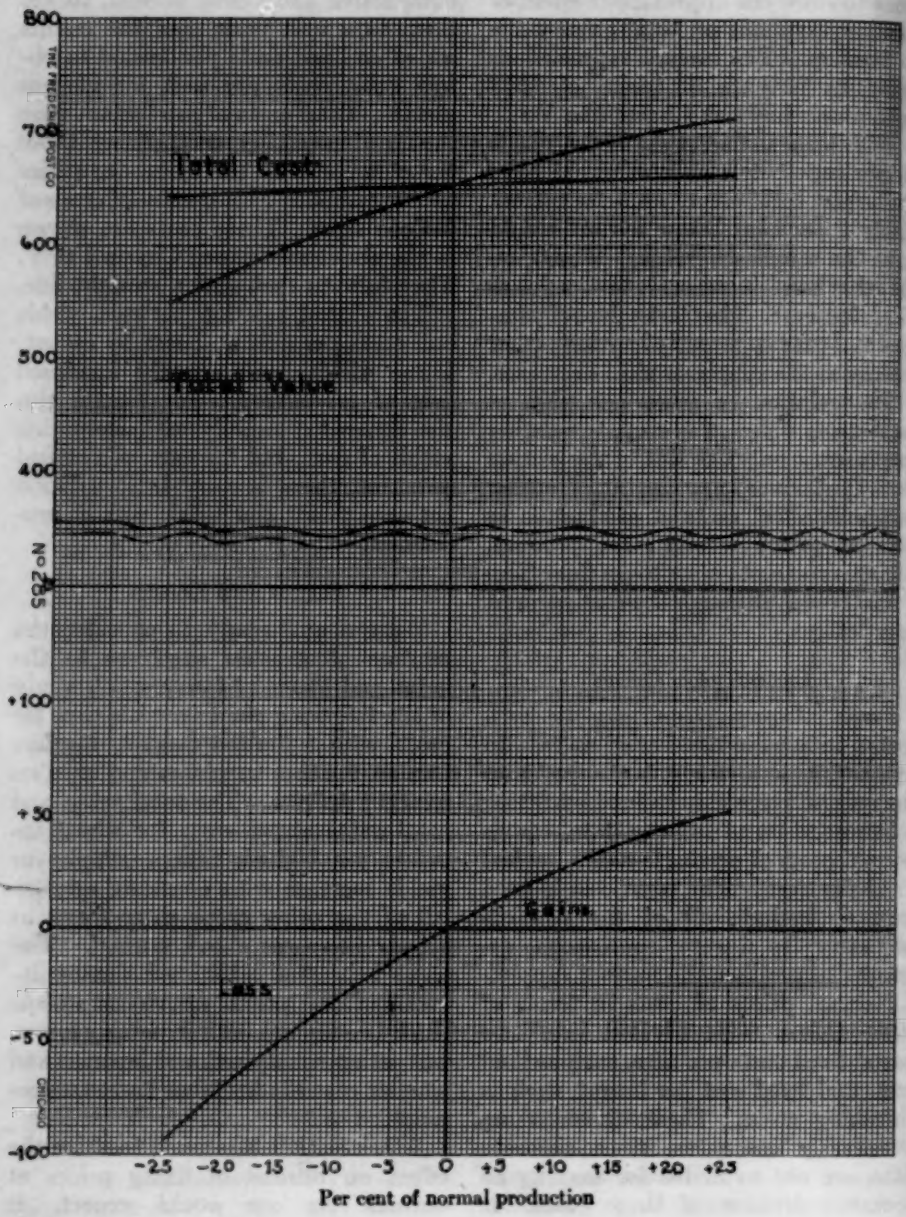


CHART II—RELATION OF SUPPLY OF POTATOES TO TOTAL FARM VALUE AND COSTS, IN MILLIONS OF 1913 DOLLARS

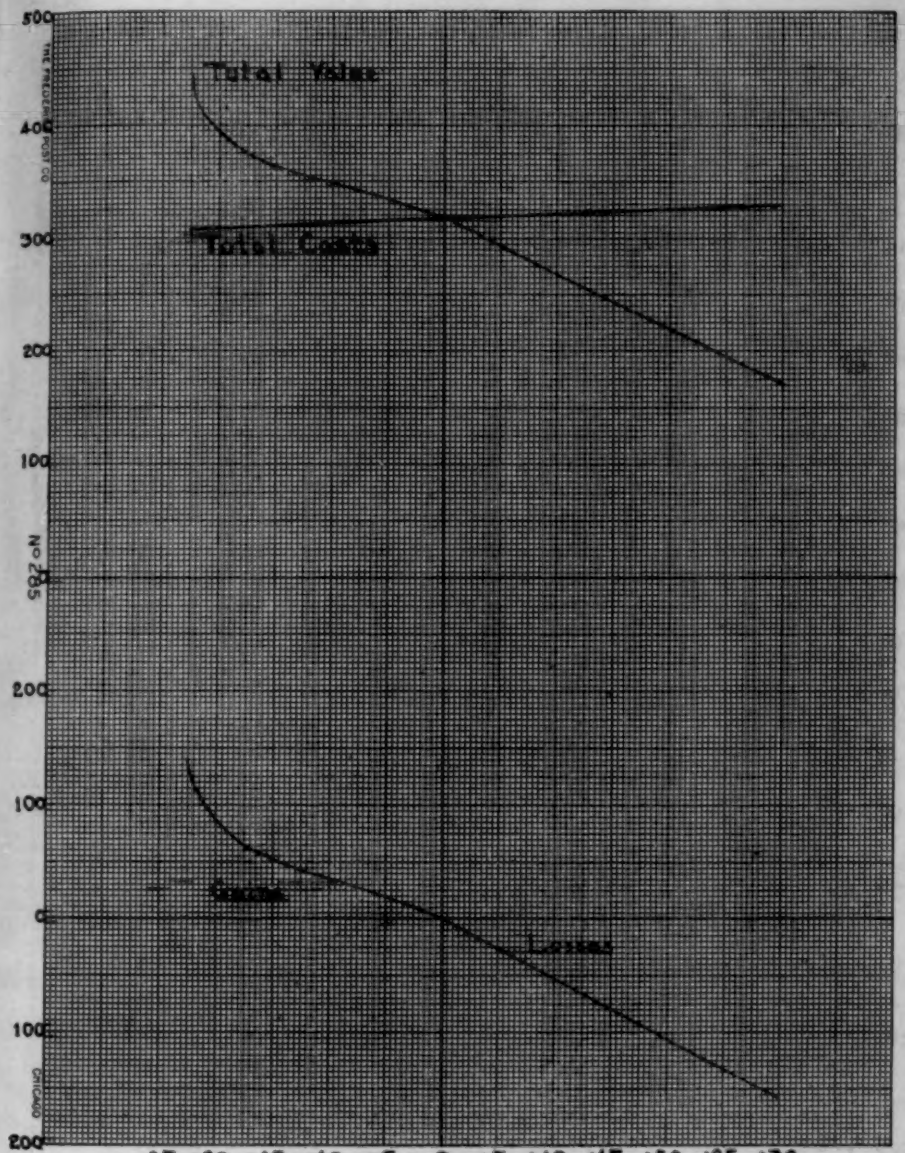


CHART III—RELATION OF PRODUCTION OF COTTON TO TOTAL FARM VALUE AND COSTS OF PRODUCTION, IN MILLIONS OF 1913 DOLLARS

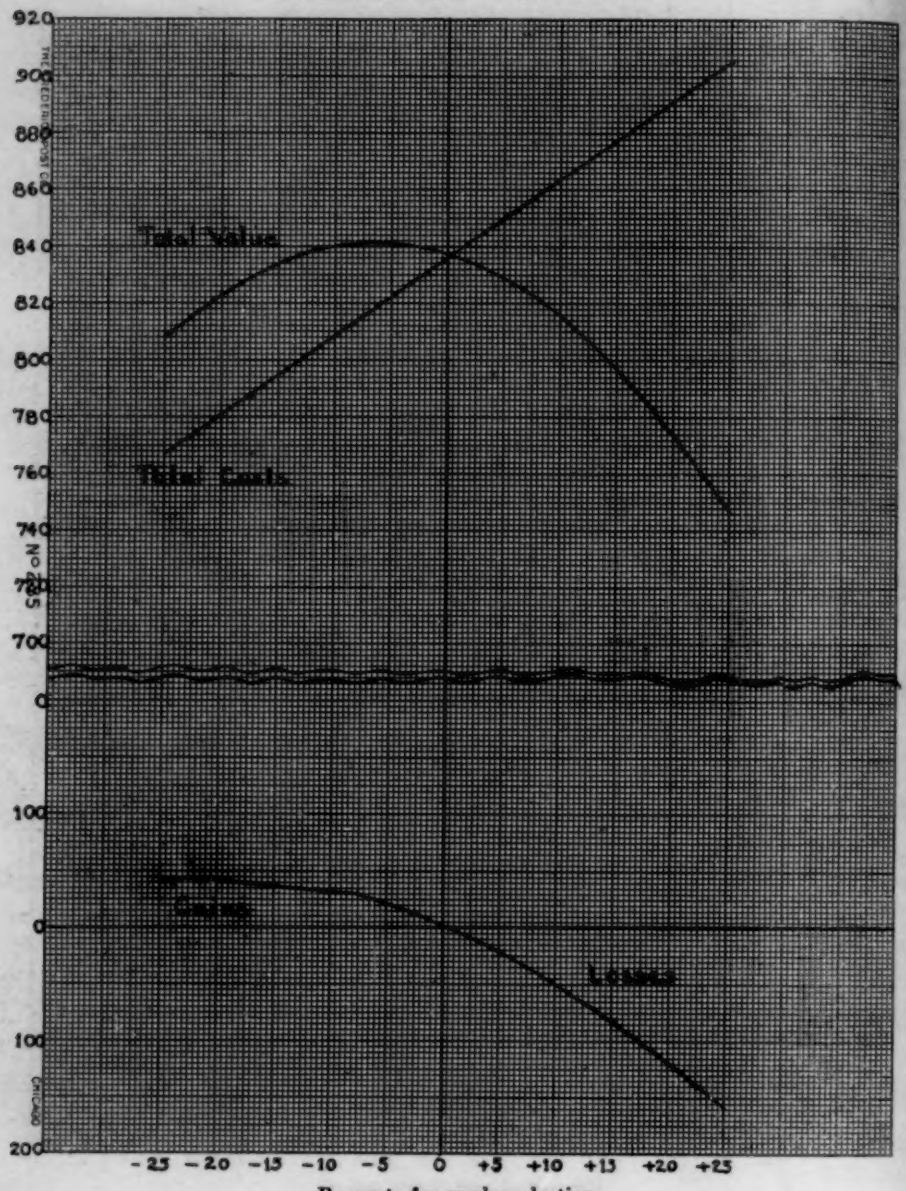


CHART IV—RELATION OF SUPPLY OF CORN TO TOTAL FARM VALUE AND COSTS, IN MILLIONS OF 1913 DOLLARS

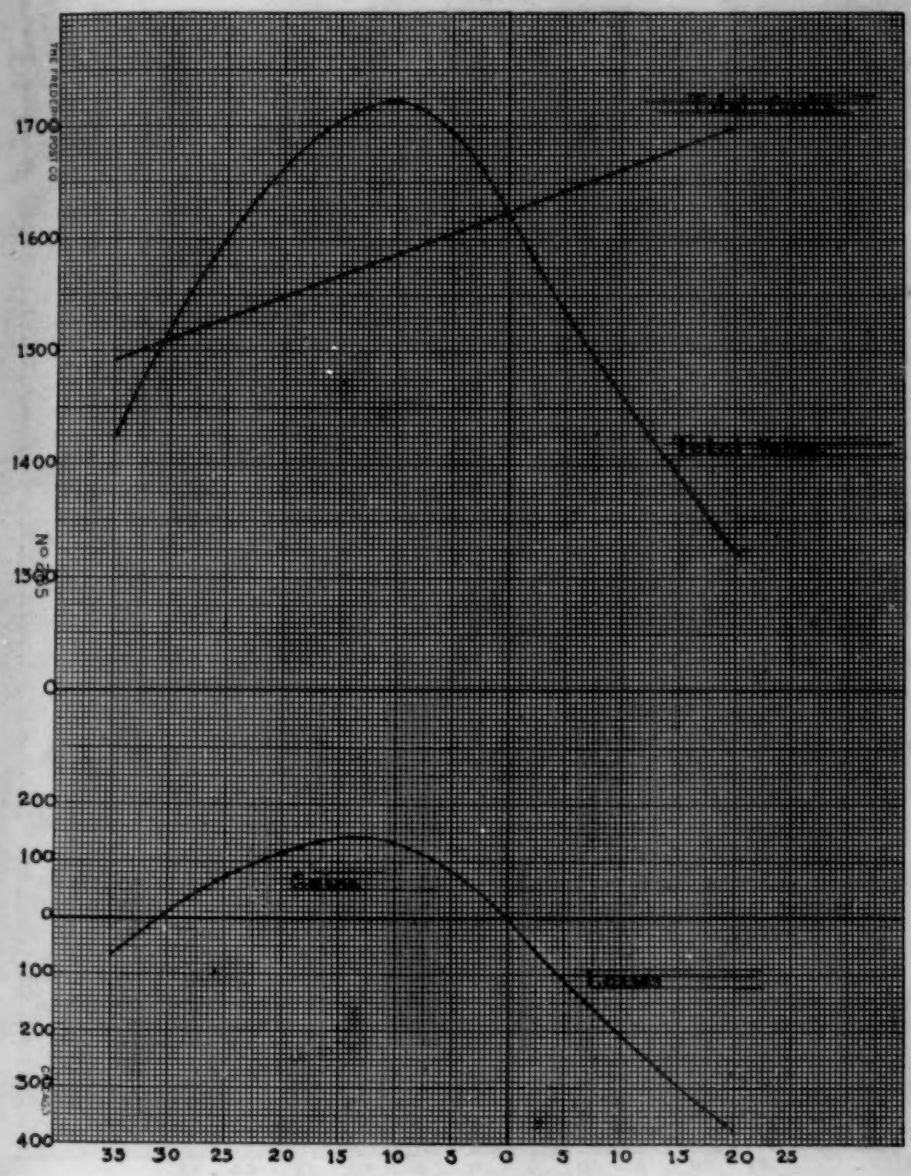
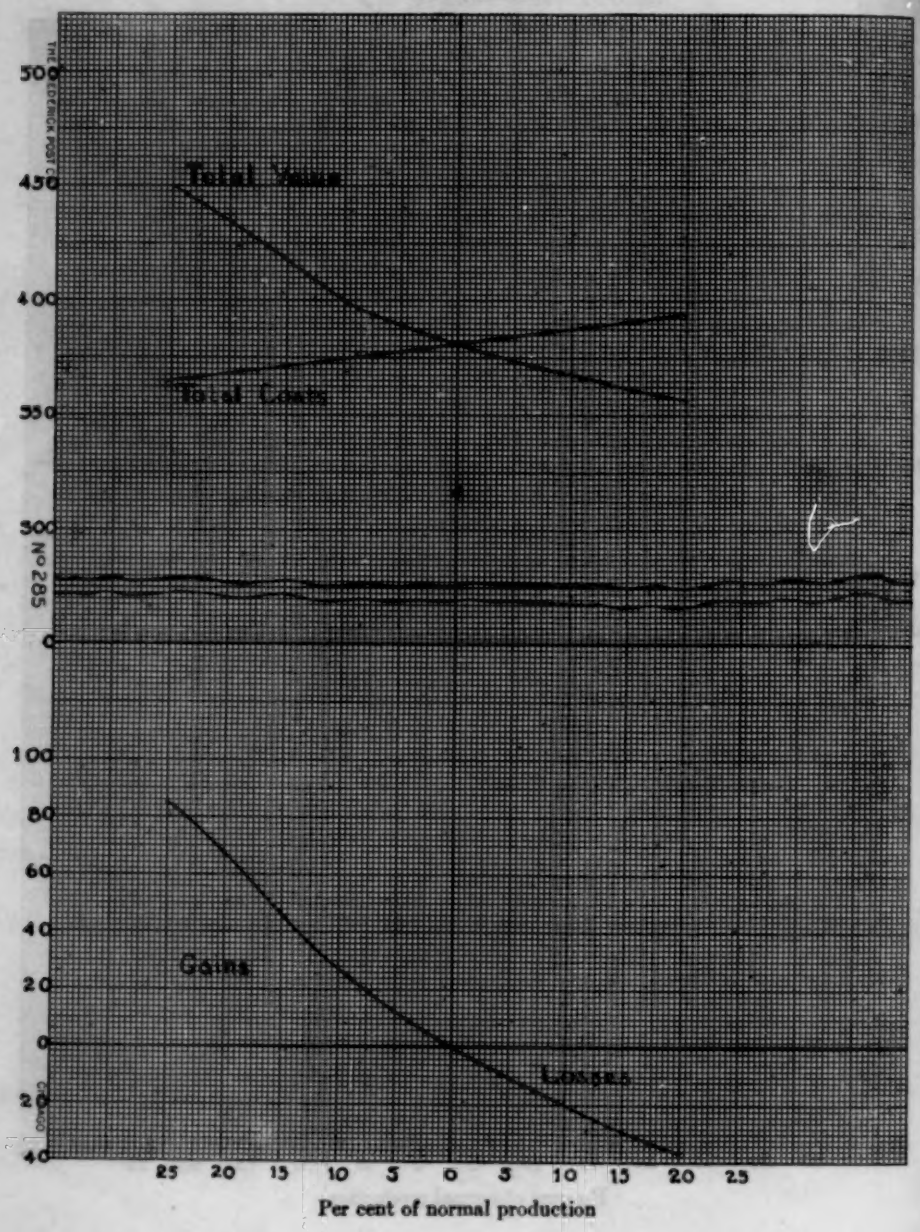


CHART V—RELATION OF SUPPLY OF OATS TO TOTAL FARM VALUE AND COSTS, IN MILLIONS OF 1913 DOLLARS



yields were small. Moreover, the losses and gains would be greater than at present.

The effect on returns to farmers of weather surpluses of wheat in the United States is opposite to that of most other crops. Farmers tend to gain on large yields and lose on small ones. This analysis, of course, assumes that production in the rest of the world is normal. If it is below normal, then the gains on large crops are much larger than those shown here. On the other hand, if the world production is above normal, our farmers may lose on both large and small crops, but the smaller the yield the larger the loss. The worst situation imaginable for our wheat farmers is a very small crop and a bumper crop in other countries. Then they would get very low prices for a very small volume. This could hardly be called a surplus problem, and none of the proposed relief measures would help such a situation. Such situations have been scarce in the past, while our farmers have had the good fortune of having many large crops when production in the rest of the world was small.

# Stabilization of Farm Prices and the McNary-Haugen Bill[1]

By H. A. WALLACE

Vice-President, Wallace Publishing Company, Des Moines, Iowa; Editor, *Wallaces' Farmer*

THE McNary-Haugen bill will not be given serious consideration by Congress next summer. No other conclusion can be drawn from the vote on November 6, when 60 per cent of the farmers of the Middle West and North West voted for the man who had declared definitely against the principles of the McNary-Haugen bill. While it is probably true that at least half of the western farmers who voted for Hoover favored the McNary-Haugen bill and nearly all of those who voted for Smith, favored the bill, the political significance of the vote on November 6 remains unchanged. The McNary-Haugen bill for the time being seems to be dead. It may be resurrected, but if so it will be under a new name.

## INCREASING THE FARM INCOME

The farmers of the Middle West were greatly pleased with Mr. Hoover's statements on agriculture at Palo Alto and St. Louis. They liked it when Mr. Hoover told them that they were not getting a fair share of the national income even before the war. They are glad that the President-elect stands for increasing the farm income sufficiently so that the farm wife can live as well as the city man's wife and the farm children as well as city children. All of this is more than the proponents of the McNary-Haugen bill expected to accomplish. They hoped to raise the price of hogs by perhaps $2 or $3 a hundred, the price of wheat by 30 cents a bushel and the price of cotton a cent or two. The McNary-Haugen bill, functioning as its proponents hoped, might perhaps have put $1,000,000,000 more money annually into the hands of the farmers. If the Hoover ideals are to be realized, however, at least $5,000,000,000 more money must be given to the farmers in the United States every year. The Hoover ideals mean giving the average farmer about $900 a year more money to spend. Those of us who are connected with agriculture are necessarily strongly in favor of such a program and, of course, we shall do all we can to help make these ideals come true.

Even though the McNary-Haugen bill seems to be dead, I am wondering if the men who spent four hard years working on this bill, do not have some things of value to offer the incoming administration when it gets down to the hard problem of working out a definite plan. The McNary-Haugen lobbyists have always represented primarily the farmers producing products for export, or in other words, the wheat farmers, the cotton farmers and the hog farmers. We export from the United States, roughly, one-half our cotton, one-third of our lard, and one-fourth of our wheat. Fat hog prices today are $4 or $5 per hundred less than fat cattle prices because hog prices are determined to a considerable extent by the weak purchasing power of European labor, whereas, cattle prices depend chiefly on the high purchasing power of domestic labor.

Before the war it was all right for the farmers of the wheat belt, the corn belt

[1] Paper read before the American Statistical Association, Saturday morning, December 29.

and the cotton belt to be hooked up in their prosperity with Europe. Before the war it was a good thing for the people of the United States that we had so much surplus in the shape of wheat, pork and cotton because otherwise we would have had to send gold to Europe to pay interest on the three or four billion dollar debt which we owed, and that would have inconvenienced our banking structure. Today with Europe owing us $500,000,000 every year instead of us owing Europe $200,000,000 the demand for our surplus farm products is not as strong as it might be. Evidently the war has created a transition period which is likely to last for at least ten years longer.

### EQUALIZATION FEE

The McNary-Haugenites believe that farmers producing products of which there is an exportable surplus are unable to get their fair share in the national income largely because the war has brought about a reversal in credit balances between the United States and other nations. Their proposal, therefore, has been to make the tariff effective on crops of which there is an export surplus. By means of a Federal Farm Board, armed with authority to levy an equalization fee against each unit of the crop marketed, a domestic price level was to be established, decidedly higher than the world price level. Wheat for instance would be made to pass into domestic consumption on the basis of $1.60 at Chicago and to net farmers on the basis of $1.50 at Chicago, while at the same time foreign consumers would be buying wheat on the basis of $1.20 at Chicago.

Without going into details I will give it as my opinion that the equalization fee would not be much more difficult or expensive to collect than the gasoline tax. With some products the machinery for collection of the equalization fee might be unduly cumbersome but with most I believe it would be quite simple. The important thing is the effect of the price changes which would be brought about by the McNary-Haugen bill on the farmers and on the country as a whole. Would a substantial increase in the price of wheat, hogs and cotton, bring about a great increase in acreage of wheat, corn and cotton? Of course the size of the equalization fee, necessarily varying with the size of the crop would to some extent be a safe guard against unduly increased acreage. It was also provided in the last bill that the Farm Board should advise producers through their organizations and otherwise in the development of suitable programs of planting or breeding so that burdensome crop surpluses may be avoided. Also the last McNary-Haugen bill provided for commodity advisory councils to coöperate with the board to work out suitable programs for the control of acreage. Also in section six of the last McNary-Haugen bill it is provided that if the board finds the producers are increasing their acreage unduly, the board may refuse to levy an equalization fee. Personally I think that any increase in prices which would be possible under the McNary-Haugen bill would not have any great effect on the acreages of such stable crops as wheat, corn and cotton. There might be some increase in wheat and cotton on the western edge of the wheat and cotton belt but in the old settled sections I would expect very little increase of total acreage of land in crops.

Of course the big problem is as to whether the farm board appointed under the McNary-Haugen bill would act foolishly or wisely. If such a board acted as wisely as the Federal Reserve Board has acted since 1921, I would anticipate greatly increased stability for the prices of agricultural

products and great benefit for the country as a whole. If the board acted as unwisely as the men who operated the Stevenson rubber plan in the British East Indies, I would anticipate a sudden prosperity for the farmers of the United States followed by a serious slump resulting from over-production. I may say, however, that the economic facts surrounding wheat, pork and cotton are such that it is impossible to advance prices as far above cost of production as the British rubber producers were able to do under the Stevenson Act.

I have never felt that the McNary-Haugen bill was a cure-all. But I have felt that it addressed itself directly to the post-war problem as it has hit farmers producing pork, cotton and wheat. No other measure has attempted to do this with the exception of the export debenture plan which was open to the criticism of raiding the government treasury.

The essence of the McNary-Haugen bill is compulsory coöperation. This is the very opposite of the individualism which has characterized our farmers until very recently. But as farmers come in touch more and more, with the modern scheme of things they perceive that they must in some way get hold of the economic equivalent of what the corporate form of organization gives to industry. They wish to maintain their family-sized units of production but at the same time gain a certain amount of centralized control over both production and marketing so that they may avoid some of the tremendous wastes which now come from wide fluctuations in production, marketing, and price.

### FUTURE LEGISLATION

The agricultural stabilization corporations which the incoming administration presumably wishes to set up will perhaps borrow a considerable amount of machinery from the old McNary-Haugen bill. The McNary-Haugenites fear, however, that these corporations will be empowered to deal only with the summer or periodic surpluses and that they will have no effective way of dealing with such products as wheat, lard and cotton.

One splendid thing about the fight for the McNary-Haugen bill is that thousands of farmers have a more genuine understanding of the tariff than ever before. With the situation as it is now developing I would expect the majority of the thoughtful McNary-Haugenites to become free-traders sooner or later. Of course some of them, like Representative Dickinson of Iowa, anticipate that after the incoming administration passes its farm bill and it becomes apparent that the purchasing power of farmers is not being helped, then it may be possible to make an equalization fee amendment. Perhaps Representative Dickinson is right and the McNary-Haugen bill is not dead but merely asleep.

The cotton folks are in a much more difficult situation than the hog and wheat farmers. Apparently they will always have a large surplus to put on the European market and will always gain from a free-trade policy on the part of the United States. There is a chance that twenty years from now we shall export very little lard and wheat and that the farmers of the Middle West, at that time, may be in position to gain more from a tariff on farm products than they will lose from the high tariff on industrial products.

For the next ten or twenty years the farmers of the Middle West and South should have the same attitude on many economic and political problems. During the past three years the congressmen from the Middle West and the South have worked together on the McNary-Haugen bill. Two years

hence they may find it essential to work together again if it is discovered that the problem of the exportable surplus of agricultural products has not been adequately faced.

In closing I would say to those who criticize the economics of the McNary-Haugen bill, "It is easy to criticize, but what have you to offer which will help the farmers producing hogs, wheat and cotton to obtain a larger share in the national income?"

# A Half Century of Coöperative Marketing in the United States and Canada [1]

By J. F. Booth, Ph.D.

Senior Agricultural Economist, United States Department of Agriculture

FIFTY years ago a development in the United States and Canada, since referred to as coöperative marketing, was in its infancy. The principle had been introduced in the marketing of dairy products to some extent in both countries and in the marketing of fruit and grain in the United States,[2] but only a scattering of small local associations existed. Today the situation is quite different. More than 12,000 associations are in operation in these two countries.[3] During the fiscal year 1927–28, a single coöperative sales agency, The Canadian Coöperative Wheat Producers, Ltd., marketed products to the value of $283,000,000, or nearly a million dollars for each business day. Several large associations in the United States, including the California Fruit Growers' Exchange, the Dairyman's League and the Land O'Lakes Creameries, handled in 1928, volumes of business ranging from $46,000,000 to $96,000,000, while approximately 150 associations in the two countries handled more than $1,000,000 worth of farm products. The total value of farm products marketed by associations in the United States during 1927 is estimated at $2,000,000,000. The volume of business handled by 251 associations reporting for Canada, out of a total of 1,085 associations listed in 1928 [3] was $298,887,241.

Today the coöperative associations in the United States list more than 2,500,000 members, while those in Canada report 460,133;[3] whereas, 50 years ago only a few thousand farmers belonged to coöperative marketing associations. Fifty years ago there were no nationally known graded products carrying the names of coöperative associations. Today in the United States, Sunkist oranges, Eatmor cranberries, Land O'Lakes butter, Diamond walnuts, Seald Sweet grapefruit, Sun-Maid raisins and the trade names of other products of coöperative associations are household words. Some have an international reputation. The same is true also of O. K. apples, Beekist honey, Co-op butter and other products of the larger Canadian associations. Fifty years ago there were only two or three coöperative acts and no

[1] All statistical information on coöperation in the United States, unless otherwise noted, is based upon information available in the Division of Coöperative Marketing, Bureau of Agricultural Economics, United States Department of Agriculture, Washington, D. C.

[2] For information on early coöperative marketing of dairy products, see the annual reports of the American Dairymen's Association; also, "Canadian Dairying," published by the Dominion Department of Agriculture, Ottawa, Canada, 1923. The first fruit marketing associations are referred to in "Beginnings of Coöperative Fruit and Vegetable Marketing," by Chastina Gardner, published in mimeograph form by the Division of Coöperative Marketing, United States Department of Agriculture, Washington, D. C., 1928. Information on the first coöperative grain marketing associations is available in "Fifty Years of Farmers' Elevators in Iowa," by E. G. Nourse, Bulletin 211, Agricultural Experiment Station, Ames, Iowa, 1923.

[3] Associations reporting to the Division of Coöperative Marketing, United States Department of Agriculture, number 11,400. Information on 1,085 coöperative associations in Canada is presented in the first annual report on coöperative associations in Canada, 1928, compiled and published by the Department of Labour, Ottawa, Canada. Not all of the associations listed in this report are engaged in marketing farm products.

government bureaus, research agencies, or colleges and universities to aid the coöperative movement. Little, if any, public recognition had been attained. Today, practically all states and provinces of the respective countries have coöperative acts. Some have acts for different types of associations. Canadian governments, provincial and Dominion, incorporate associations under special acts. Most high schools, collegiates, colleges and universities teach coöperative marketing either as a special subject or as a feature of courses in marketing, agricultural economics, or general economics.

Perhaps, however, the greatest change of all has come in the matter of public recognition. The subject of debate at the crossroads store and country school house a half century ago was the subject of a national referendum of the United States Chamber of Commerce in 1928, when 2,816 members indorsed the coöperative marketing movement compared with 117 against it. The discussions of rural communities of 50 years ago have become matters of public interest, for the encouragement of which government bureaus have been created. From a place of comparative obscurity to an issue of national and international importance today is the progress of coöperative marketing.

A development of such magnitude has not been attained without the experiencing of some growing pains. Mistakes have been made. Exploitation has been evident and failures have occurred. In short, the movement has suffered temporary reverses—progress has not always been uniform. Each reverse, however, has added something to the storehouse of experience and has strengthened the foundation for further expansion. This process will continue, but the present is a good time to take stock of what has happened—to inventory the present status of the movement, to set forth, if possible, a few of the significant things that have taken place and to appraise the factors that have contributed to the development of coöperative marketing.

## Local Associations Characterize Early Movement

Prior to the World War the coöperative movement was characterized by small associations of the community or local type operated as independent units. A few large associations such as the California Fruit Growers' Exchange and the Eastern Shore of Virginia Produce Exchange in the United States together with the United Grain Growers', Ltd., and Saskatchewan Cooperative Elevator Co., Ltd., in Canada, had operated for some years. There were a few others in each country, but the list was not large. Since the war, however, the number of large associations has greatly increased. Why, then, did local associations predominate for 30 or 40 years, and why has much more progress been made in the formation of large associations in comparatively recent years?

The assembling of farm products at local points was an undertaking with which farmers were familiar. Therefore, when they felt that the margins taken by local dealers were too wide or their service unsatisfactory, they would establish a local coöperative association. Almost invariably margins were narrowed and services improved.

The coöperative movement was thus characterized by local associations. Over 5,000 of these associations engaged in selling farm products or buying farm supplies were in operation in the United States in 1915,[4] and several

[4] Technical Bulletin No. 40, "Agricultural Cooperative Associations Marketing and Purchasing, 1925," by R. H. Elsworth, United States Department of Agriculture, 1928.

thousand more were formed during the next few years. Similarly, large numbers of local associations had been formed in the Canadian Provinces where, for some years, the Dominion and certain provincial governments had taken an active interest in establishing associations.

The time prior to and during the World War was a period of expansion for agriculture. For about 25 years following the depression of the early nineties the agriculture of Canada and the United States responded to improved market conditions at home and abroad. Prosperity was not uniform, it is true, but in the main agricultural conditions were good, as is proven by the expansion that took place. The climax was reached during the war when farmers responded in even greater measure to still higher prices and patriotic appeals for increased production.

During this period there existed what might be called a sellers' market. With prices moving upward and with a prosperous buying public, the market for most farm products was fairly good and prices generally satisfactory. Combination of sellers on a large scale to effect increased bargaining power did not appear necessary. Nor did competition among sellers appear an important factor as it became later. In short, private dealers in farm products and local coöperative associations were able to satisfy their farmer patrons.

Such were the conditions prior to 1920. Except in a comparatively few cases, where agricultural conditions were out of line with the general situation, or where outstanding farm leaders came to the forefront in spite of the general apathy toward further organization, there was comparatively little effort made to combine local associations into larger operating units.

Then came 1920 and a complete reversal of conditions. Inflation was followed by deflation. High prices were succeeded by ruinously low prices and prosperity gave way to depression. In the scramble of readjustment agriculture, because of the nature of the industry, was at a disadvantage. Reduced buying power abroad and changed buying habits at home seriously reduced the consumption of agricultural products and produced what is commonly referred to as a surplus. This condition of affairs brought what might be termed a buyers' market and forced upon the sellers of agricultural products, private and coöperative, a condition demanding organization for more effective salesmanship. This has forced private dealers to merge their activities to eliminate unnecessary competition. Similarly, it has also forced local coöperative associations to federate or has brought about the creation of new associations controlling large volume.

This reversal of relative positions has brought new problems which can only be met by large associations capable of providing the service demanded by a discriminating public. The high degree of standardization available in manufactured or processed commodities has encouraged the public to expect the same in farm products. Considerable success has been attained by large coöperative associations in meeting this demand, but it is a service which local associations operating independently find it difficult to give. The consumer demands also a steady supply in quantities to suit his convenience. Furthermore, he expects the producer to make known what he has to offer. And finally, because of the abundance of agricultural products, it has become necessary for sellers to combine forces to eliminate undesirable and expensive competition, to stabilize prices and to provide the merchandising advantages

which only control of a considerable portion of the supply will give.

These demands of the buyer require a degree of grading, standardization, warehousing, financing, advertising and merchandising which local coöperative associations operating independently cannot usually provide. It is this change of economic conditions, this reversal of the relative positions of buyers and sellers that has brought about the trend toward larger associations in recent years. Changed economic conditions have thus been an important factor in one of the really significant developments in coöperative marketing.

### Coöperatives Extend Operations

Development of large coöperative associations has resulted in extension of the markets for many agricultural products. Grading, standardization and merchandising have made possible a wider distribution. The products of communities which, in many cases, would reach only local markets, through the medium of the large association, are put into markets otherwise inaccessible. Representatives or branch offices of large associations are located in distant cities and, in some cases, as for example in the case of the Canadian Coöperative Wheat Producers, Ltd. (the Wheat Pool), are to be found in the markets abroad.

New markets and new uses for agricultural products have been developed. By-product plants are being operated by many large associations to utilize off-grade products which, in some instances, would have no value, and in others would depress the price of the better quality. Warehouses and cold storage plants have been acquired to handle seasonal surpluses and special machinery has been installed, often invented and patented by the associations, to handle these products. These are some of the more important services provided by large associations in response to changing economic conditions, and they represent a significant development of recent years.

### Improved Business Practices

Distinct improvements in the business practices of coöperative marketing associations have been brought about during the past few years. In the early period of local association activities, business was often conducted on a very informal basis. Loosely formed associations, without adequate accounting and frequently lacking even the crudest form of record keeping, were common. Failure to keep satisfactory records, coupled with the absence of regular audits, was frequently the cause of failure. Even when failure was not directly attributable to this cause, the resulting winding-up of the association's affairs was frequently more unsatisfactory than it need have been, because of lack of proper records. Resulting injustice to creditors and members alike caused many to refuse to have anything further to do with coöperative organizations.

The absence of coöperative acts and the failure or inability of many associations to incorporate under general corporation laws was frequently a cause of failure. In many such cases, again, injustice was done certain creditors or members and losses were heavier than they might have been had incorporation been sought and the rights of individuals protected.

Business practices have greatly improved in recent years, and many of the distasteful experiences of the past have become but a memory. The provision of coöperative acts and the general practice of incorporating associations in recent years have contributed materially to the stability of the movement.

### IMPROVEMENT IN ORGANIZATION SET-UP NOTICEABLE

For a time during the period of organization activity following the war, there was considerable discussion as to the best method of organization. Most of the large associations then operating were composed of federations of locals or were so organized as to depend upon the local unit to assemble the products. In sharp contrast, there developed a school of thought favoring highly centralized associations. Extremists of this school were inclined to disregard the local association entirely, while others gave it a place of relative insignificance. The contending parties each believed that the principle of organization which they supported could be applied in the marketing of any farm product under any condition. While this conflict of opinions originated and was most pronounced in the United States, the issue found its way into Canada where, however, the differences in points of view also involved other matters. The experience of the last 10 years, however, indicates that no stereotyped form of organization can be universally applied. There are instances where each of the suggested methods is in successful operation. Many associations today are of a hybrid form, embracing features of each type of organization set-up. Experience indicates that the form of organization and method of operation must be fitted to the peculiarities of the product to be handled and to the trade practices and customs of the people who are to use it.

Similar differences of opinion developed as to the merits of contracts between coöperative associations and members. While differences of opinion still exist on this question, there is a growing tendency, more particularly in the United States, to modify points of view. It is evident that contracts are not essential in all cases, for there are many successful coöperative marketing associations operating without them. On the contrary, however, contracts are being used and are considered almost indispensable in many instances. Contracts, however, differ materially in their provisions, and in the last two or three years those embracing withdrawal features have been adopted by many associations that previously used the five-year contract. In Canada, however, where the contract was not adopted to any appreciable extent until about 1924, the long-term contract without withdrawal privilege is strongly supported.

### IMPROVED FINANCIAL STANDING

A noticeable improvement in cooperative financing has come about in recent years. The idea once held, and which still persists in some quarters, that a coöperative association could operate "on a shoestring," is gradually vanishing. There are today thousands of associations with very substantial amounts of capital. Farmers, apparently, are beginning to appreciate that coöperative associations must be at least as well financed as their private competitors. Stock and patronage dividends are being left with the associations and surpluses are being added to reserves to provide against contingencies.[5]

The capital investment of many of our large associations in recent years has assumed large proportions. The members' investment in the Dairymen's League, in 1928, amounted to about $15,000,000. Amounts frequently in excess of a million dollars are

[5] Further information on this subject is available in a mimeographed release, "The Value of an Adequate Reserve for a Coöperative Milk Marketing Association," by Chris L. Christensen, published by the United States Department of Agriculture.

invested in large-scale associations such as the Staple Cotton Coöperative Association, California Fruit Exchange, Sun-Maid Raisin Growers' Association, Twin City Milk Producers' Association and the California Fruit Growers' Exchange, in the United States. The assets of United Grain Growers of Canada, in 1928, amounted to $14,663,011, while the combined capital of the Canadian wheat pools amounted to about $25,000,000.

Not all associations require large amounts of capital. Some agricultural products are moved to market with comparatively little delay and without the expenditure of large amounts for grading, warehousing or processing. The tendency in the past, however, has been to consider all products in this class, whereas many require the use of expensive plants and equipment in their preparation for ultimate use. Fortunately, this fact is becoming better understood and producers are contributing more liberally where large amounts of capital are necessary.

There is also a very noticeable improvement in the attitude of credit institutions toward coöperative financing. Whereas, a few years ago it was often difficult for a coöperative to obtain credit, today the situation is quite different. Local associations are receiving, on the whole, greater consideration by local banks, while many of our large associations are borrowing millions of dollars from large banks in commercial centers far removed from their place of business. The Intermediate Credit Banks of the United States have done a great deal to improve the credit situation. In addition, the general improvements in business practices introduced by the associations have done much to increase confidence and to justify this greater extension of credit.

Probably the outstanding illustration of confidence in coöperative business methods is furnished by the experience of the Canadian Coöperative Wheat Producers, Ltd. This association has obtained credit advances in excess of $60,000,000 at one time from a committee of Canadian banks.[6] It requires more than a merchantable commodity to justify such advances. Confidence in business methods and in the integrity and ability of coöperative leaders is a first essential.

### Coöperative Movement a Great Educational Force

Until the advent of the coöperative movement and more particularly since the development of large associations, the producer knew relatively little about the process of marketing, or about the economic factors affecting the price of the commodity he had to offer. When farm products were all turned over to private dealers the farmer knew comparatively little about the supply and demand for such products or the factors concerned in their marketing such as grading, warehousing, financing, advertising, processing and merchandising. Frequently it was not of particular interest to the private dealer to keep his producer customers informed on matters of this kind. When the coöperative associations came into the field, however, the situation was altered. The farmer member at once became a part owner in the marketing agency and for the first time became definitely interested in what happened to his products after they were delivered to the local marketing agency. As associations have enlarged and extended their functions, producers have acquired a comprehensive knowledge of the problems involved in the

[6] Statement of A. J. McPhail, President of the Canadian Coöperative Wheat Producers, Ltd., at the Kansas Agricultural Convention, Topeka, Kans., January 10, 1929.

disposal of their products. Where direct contact with the association is difficult, as in the case of many large associations, the member is kept informed by means of field service men, by the use of the press for educational purposes and through meetings of members.

The knowledge which farmers have acquired concerning marketing depends largely upon the degree to which they have carried their coöperative activities. Where no association exists, relatively little is known concerning the actual market situation. Where progress has been confined to the operation of local coöperative associations the member's experience, though broader, has taken on a community point of view. But when these farmers and local associations become associated with a large organization interested in carrying the product through its various marketing channels, the member's knowledge of marketing problems tends to become as broad as the activities of his association. The contribution made by such organizations as the California Fruit Growers' Exchange, Dairymen's League, Land O'Lakes Creameries, United Grain Growers, the Canadian wheat pools and other associations in this respect is very evident.

It should be observed also that a great deal of educational work dealing with the marketing of farm products and with economic conditions, directly and indirectly affecting agriculture, has also been carried on by research and educational institutions and by Federal and State Government Bureaus. The net result of the activities of these various agencies, added to the practical experience derived by farmers from participation in coöperative activities, has resulted in a better informed membership and a more intelligent body of citizens.

Until quite recently hesitation was expressed in certain quarters as to how far our educational and research agencies should go in indorsing and encouraging coöperative marketing. Persons engaged in educational work as agricultural teachers, and extension workers and county representatives have hesitated at times to take an active interest in the coöperative marketing movement, lest the failure of particular associations jeopardize their influence and throw suspicion upon other phases of their work. This attitude has been most pronounced in the United States but has also been evident in certain sections of Canada.

A change has now come about, however, due in the main to the fact that coöperative associations have demonstrated their worth. Public announcements have been made recently by officials who direct the policies of these agricultural workers in the United States, urging the workers to give the same consideration to coöperative marketing that they give to problems of production or other matters affecting the welfare of agriculture. Much the same policy has been pursued in recent years by responsible agricultural officials in those sections of Canada where recognition of coöperative marketing had been a little slow.

### INDIVIDUALITY OF FARMERS LESS APPARENT

Much has been said and written about the individuality of farmers and their inability or refusal to work together. By reason of the nature of his occupation, the farmer is a combination of wage earner and capitalist. Economic and environmental conditions have tended to make him an individualist, but a change is taking place. The coöperative movement, particularly that phase of it dealing with marketing, has provided a medium

through which the individual can participate in group action where combination of effort is most effective, while at the same time retaining independence of action as a producer. A movement embracing upwards of 3,000,000 members has made a real start toward group action. A group of organizations, each of which markets the products of from 50,000 to 140,000 farmers, is effective refutation of the oft-repeated assertion that farmers will not work together. The coöperative movement is breaking down the isolation of farmers and is bringing about unity of action where unity seems desirable.

### Coöperative Movement Assumes a Position of Permanency

The coöperative movement, particularly that phase of it dealing with marketing, appears to have assumed a position of permanency. The uncertainty that characterized a good deal of early activity seems to have been set aside. Hundreds of associations have now been operating successfully for 20 or 30 years and many for longer periods. During the years of experimentation, methods of organization and business practices have been modified and improved to meet the peculiarities of particular cases; a trained personnel has been built up; research agencies maintained by the associations and by Provincial, State and Federal institutions have been engaged to work on coöperative problems; educational activities in behalf of coöperative marketing have been undertaken by hundreds of privately endowed and publicly supported institutions; producers have acquired an appreciation of the benefits to be derived and the public has expressed interest and volunteered support. In short, the coöperative marketing movement appears to have assumed a place of permanency along with other institutions and practices of proven worth.

This should not be interpreted as meaning that there will not be individual failures, or that the movement will not experience temporary reverses, but rather that progress will follow much the same general upward trend that other worth-while movements have experienced. Developments of recent years in coöperative marketing appear to justify such a conclusion. Out of the experiences of a half century has been developed a movement which is having far-reaching effects on the economic life of the United States and Canada.

# Recent Trends in Coöperative Marketing

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LOOKING back over the history of coöperative marketing in America, a history now covering a little over a half century, we can discern about three phases, with minor variations of views and practices. In the earliest years, those of the Grange and the Farmers' Alliance, there was a clear-cut, dominant conception of the marketing problem. It consisted mainly of an appreciation of the undoubted fact that there was a wide gap on the one hand between the prices paid by the farmers for finished goods and the prices received by the manufacturers for the same. On the other hand there was a similar wide gap between the prices received by the farmers for their produce and the prices paid for the same by buyers in, or beyond, the wholesale market.

## Early Days of Coöperation

With a concept so simple and so definite concerning an evil so easily diagnosed, the remedy was little short of obvious. The difficulty to be overcome, *i.e.*, the evil in the economic world causing farmer distress, was a middleman affair. True the railroads figured largely in the minds of the Grangers, and just as true, the control of the price level became an issue with the Alliance, but, nevertheless, the main concern of the coöperatives so far as there were any, and the main idea in the minds of those who inspired the organization of such coöperatives, was that of "shortening the road to market."

So far as anything in the nature of an economic theory was expressed by the leaders in those early days of coöperation, it was nearly always a statement of the relation of cost of production to value, with the naïve inference, if not assertion, to the effect that a producer was entitled to his costs. This view was enforced by a declaration that business people, other than farmers, always were able to compel the payment of a price sufficient at least to cover costs. Just how this was accomplished no one took the trouble to explain, but it was assumed that something in the nature of monopoly was present not alone in the charges made by railroads, but also in the general run of prices charged by manufacturers for their goods. In fact the Granger activity is often referred to as an anti-monopoly campaign. The Grange, and in a great measure the Alliance, was impressed first and last by the middleman margin. Bringing the producer and consumer together was the one great goal of the farmer organization efforts for a period of over twenty years near the close of the last century.

This view implied a concept on the part of the leaders of the day of a market which was relatively, if not positively, good, if only it could be reached, that is, reached without too great an expense. These were the days of the greatest production per capita yet experienced in the United States. We were producing over nine bushels of wheat per capita, and enough meat so that after selling some twenty-five pounds per capita abroad, we had left enough to provide us with a pound per person daily. If we ate that amount, it was a great feat, sufficient to account for the failure to reach the ideal in physical health. Yet with this enormous output, even increasing output, it hardly occurred to anyone of the

farmer spokesmen of the day to remark that the market was oversupplied.

This may be due to the persistent fact that, no matter what the price level, there was always and ever the wide, unaccountable margin between the prices received by farmers and the prices at which the goods sold a little later. This view was expressed tersely by a Western editor who remarked that it took four bushels of Iowa corn to get the fifth one to market. The market alluded to in this case was New York City, and the inference was that Western corn prices were made in New York City, the farmer getting that price minus freight and middleman deductions. That there was too much corn, too much pork, and too much wheat escaped the observation of the leaders of that generation. Nor is this comment a refutation of the supposed fact that middleman charges were unfortunately high. They were, but the other set of facts and forces was fully as important, and to us at the present time distinctly obvious.

The farmers of the last century, and their friends, were not alone in mistakes of the sort pointed out. They were, no doubt unconsciously, looking to some group other than their own on which to lay the blame for lack of farm prosperity. These other groups were no doubt guilty of the charges made, at least to a great extent. It may be more attractive to the aggrieved party to undertake the removal of the mote in a brother's eye rather than the beam from his own. The feasibility of the operation is, however, usually another matter.

The farmer movement of the last century was distinctly influential in bringing some semblance of order into the chaotic world of transportation. It left unconquered the field of the middleman. More recent marketing movements—the second type coming into vogue early in the twentieth century—has changed the center of gravity of farmer influence. It was at that time that the farm leaders first came to a realization of the fact that the quantity produced was a major factor in the price equation.

Efforts were made to curb production in the interest of higher returns for the quantity put on the market. This was tried most conspicuously in connection with cotton. Over and over the coöperative group advised the planting of a smaller acreage only to find, with one or two exceptions, that the results were negative. One would be pardoned in saying *positively* negative, since without doubt the advice instead of being ignored led to a move in the opposite direction, with the result that the acreage was greater because of the advice, coupled with the hope that it was likely to be followed by the majority, thus making a larger crop desirable from the standpoint of the individual. Whatever other explanations may be offered for the actions of the coöperative leaders of 1902 to 1916, or thereabout, it will be necessary to admit that they came to a realization of relationship of quantity to price, and made an effort to fit the supply to the demands of the market.

Almost at the same time came the counterpart of the campaign for smaller output, viz., an attempt to stimulate the demand. The California Fruit Grower's Exchange was one of the first companies to realize the advantages of this procedure. People were advised—on the advice of physicians—to keep their systems alkaline and later to eat oranges because of their anti-scorbutic properties. All of this meant more oranges without a lowering of the price. The raisin people taught the world how to sell a larger quantity by taking a carload to the city side tracks and at the same time advertising

liberally the qualities of raisins. Various milk associations put on milk campaigns, furnishing free milk to certain school children, with a certificate of growth and health improvement during the period of the experiment. All of which is very fine for the groups immediately interested. But in the meantime someone else was selling fewer apples because of the increased sale of oranges, and still someone else fewer currants, cherries, or raspberries because of the augmented raisin sales.

### CONDITIONS AFTER THE WORLD WAR

During the period just following the World War came an unprecedented growth of coöperative marketing companies. There were developed two unrelated lines of effort in solving the marketing, or price, riddle. First in the field came the advocates of a mild, but clear-cut, monopoly. The producers were admonished to organize, get control of some certain amount of the produce, usually somewhat more than half. This control was expected to serve as the basis of price making, by, and to the advantage of, the producers so organized. While there may properly be grave doubts as to the possibility of creating a price-naming body by these means, there was, by all means, the possibility of creating a bargaining group with sufficient power and skill to demand, and get, the best price which the circumstances of the case permitted—an achievement of no small moment. A large part of the organizations, and several of them of notable size, overshot the mark in their zeal to aim high, and came to grief.

Still another distinct line of effort manifested itself just after the close of the war. This was the attempt to bring the power of the Government to bear on the case in a direct manner. The advocates of this plan had evidently lost faith in the voluntary coöperative movement, and wanted to make coöperation compulsory by providing a means of reducing supplies to an ideal level (from the producers' standpoint) and compelling all alike to stand the expense of the transaction—the charge to be added to the consumers' bill. This plan is unique at any rate. Should it ever be tried, and found feasible, there would logically be a demand to adapt it to all lines of manufactured goods as well as to farm produced goods. In fact some farm goods, so-called, such as butter, are the results of manufacturing just as clearly as are the products of the tanneries, the sawmills, the reduction mills, and the blast furnaces. Whatever may be the merits of this type of Government interference and control, it is evident that the proposal is not likely to be given a trial in the near future.

This brings us to the third main line of effort, the last two items mentioned being in the nature of episodes, a remark not at all intended to belittle the effort to put the burden of marketing into the hands of the Government. This third effort involves two main parts: The first is that of a direct control of supply. The second is an attempt to adapt the supply to the demands of the market.

In the control of supply we have made but modest progress. The best instances thus far are probably those of the supply of milk for a given market. This control is all the more likely to succeed because it is by no means either arbitrary or drastic. For example, in the Milwaukee and other milk markets, a dairyman is paid a certain price, arrived at through bargaining, for a designated, "basic," amount of milk. For added amounts he receives a priced based on a lower use, as for the manufacture of butter or cheese. This provision has resulted in a smaller sur-

plus during the months of greatest supply than was ever before known. The dealers are not subjected to the losses attendant upon caring for a commodity they do not want, and the farmers are rewarded for adjusting their supply, at least in part, to the demand.

Another recent development is observable in the sale of butter. It was found by a group of Minnesota creameries that the demand for butter of a certain kind was greater than the supply. This group, greatly enlarged, has been able to supply the market with more and more of the desired kind of butter, and conversely the market has shown a remarkable capacity to absorb a great quantity of this grade of butter at a price distinctly above the general level of butter prices. Here is a case of finding what the market wants and profiting by it—an old practice in the manufacturing world, a new one in agriculture. It will be asked what will happen when the creameries of the Northwest furnish enough of this kind of butter to supply the palates of the consumers? Will it mean that the premium for this grade of product will be lessened? Undoubtedly. But the advantage of a supply controlled with respect to quality will always have an advantage over the miscellaneous products, and the well-trained, well-organized, producers will be in a position far superior to that of the rank and file of those on the outside. The organization will, for example, be able to pay its own members on the basis of quality, whereas, the usual thing of the past has been to make little, if any, distinction in this respect.

The recent cotton studies being made in the Bureau of Agricultural Economics should result in nothing short of a revolution in the marketing processes. Thus far the most excellent cotton has hardly brought more than that of ordinary quality.

## PRESENT-DAY TRENDS

It would, therefore, seem that the trend of the present up-to-date coöperatives is in the direction of one or all of the following results: First in conquering of the market as it now exists. This is being done conspicuously by the citrus growers, and by the Canadian wheat pools. In a sense this is a development of the earliest ideas such as dominated the Grangers. Second, the adaptation of the product, especially regarding quality, to the demands of the trade,—exemplified by the Land O' Lakes creameries, and in prospect for cotton coöperatives. Third, control of output. This is the latest, and might in a sense be viewed as the last field to be entered—yet with the hope of some success at least, even though it may never be conquered. The best instances of attainment are within the restricted areas of city milk markets. Producers for the Philadelphia market are controlling their output quite definitely. The lemon growers limit the shipments to the general trade, using the surplus as a by-product. The walnut growers do the same.

It must be admitted that thus far, where the best results in relation to a great agricultural product such as wheat are involved, the most hopeful program is that of studying the market, and adapting the supply to it, rather than attempting a control over the supply. Coöperatives shrink from an attempt to control supply, yet in all business success on a large scale undoubtedly the greatest results in marketing have come either from offering goods more desirable than the general run; cutting costs so as to meet all competition; or, where circumstances permit, limiting the output. Farmers are learning the same lessons, and the trend among the best coöperatives is in the

same direction, or rather in one or all of the several directions. This is in contrast with the earlier efforts to reduce the middleman's profits by cutting down his margin, or the naïve method of undertaking to control output by fiat.

Just as business people generally have learned the advantage of volume in connection with their operations, the farmers are learning that successfully coöperation is closely associated with volume of transactions. It must be admitted that the best thought of the present day involves the main views of a half century ago, but in a more refined and feasible form.

# Standardizing Production—What Has Been Done and What Can Be Done

By Wells A. Sherman

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STANDARDIZING agricultural production is a very different matter from standardizing the products of industry. Similar raw materials subjected to the same mechanical and physical processes with the maintenance of uniform temperatures and the use of accurate dies, moulds, patterns, and mechanical appliances should give us uniform or standardized industrial products. Broadly speaking, we can standardize these processes with reasonable assurance that when this is done we shall also have standardized the finished goods.

Agricultural products are the results of life and growth and cannot be standardized by such simple and controlable processes. Rainfall and temperature are two of the dominant influences on all plant life. They correspond to ingredients in the composition of manufactured articles. Neither man nor nature has completely standardized either. There is no part of the United States where farm crops are grown in which nature regulates the temperatures with the precision which man maintains in a cold storage house on the one hand, or in a blast furnace on the other. Even where water is supplied by irrigation there is frequently an irregularity of supply and sometimes considerable variation from season to season or even from month to month in its temperature or chemical content.

Nature seems to produce certain types or species with almost absolute fidelity, and we say that like begets like. There are fairly constant differences between wheat, rye, and maize—differences which always persist in the products manufactured from them. There are equally constant differences between cattle, sheep and hogs, and between their products. To this extent nature standardizes what she produces through her life processes. But nature also produces an indefinite number of minor variations within the breed, species, or variety. As soon as man began to domesticate animals and cultivate plants he seems to have taken advantage of these variations to produce by selection individuals and types particularly suited to his needs.

## Progress

The greatest progress in the conscious and systematic production of specialized breeds, types, and varieties has been made within relatively recent times. It is probable that vastly more has been done within the last fifty years than in any preceding similar period. Prior to the last few generations beef types and dairy types of cattle were separated geographically, each type having been developed by the selection of animals which catered to the needs or preferences of a local population. Today we may find on adjoining farms over wide areas in the United States some of the finest herds of beef cattle and of dairy cattle. Their development or improvement has been so rapid that the standards by which such animals were judged only a few years ago are no longer adequate or applicable.

By the selective process differences almost as great have been developed

between the fine wool breeds of sheep which are grown primarily for the value of their wool in the manufacture of fine fabrics, and the mutton breeds which are produced primarily for the table.

Wheat was once wheat. We need not go very far back to find our ancestors making little distinction between varieties, and using practically all wheat in the same way and for the same purposes. Perhaps the secret was that no one market drew wheat from such widely different sources of supply as to bring together markedly different types which would have suggested different uses and values. Modern commerce has changed all this. Our larger markets in this country offer the products of every type of wheat grown within thousands of miles, while in the markets of Europe may be found the actual grain from every quarter of the world which produces a surplus. Inevitably under these conditions wheat ceases to be simply wheat for purposes of trade, and different varieties will be purchased at different prices for different uses. By selection and breeding for these particular uses the different types of wheat are apparently growing further and further apart. Man is helping nature in the refinement of her processes of standardization.

This process has gone on in connection with almost every animal and vegetable product of the farm with such rapidity that it is now hardly too much to say that we have specialized types of every agricultural product for special uses. Among domestic fowls we have the meat breeds, the general purpose breeds, and the egg breeds; breeds which will still incubate their own eggs and care for their own chicks, and others in which this instinct has almost entirely disappeared. Through selection, aided by a different combination of environment and feeding, we have produced ornamental breeds of bantam poultry so small that their intrinsic value has become a minus quantity. For practical purposes they may be classed with canary birds, goldfish, and Pekingese pups.

Corresponding changes have been brought about in those vegetable products in which some part other than the seed is desired for human use. In the latitude of Washington, D. C., with approximately six frost free months in the year, we can produce in the open garden radishes of one type or another for every month in the year. Just over the fence a row of six or eight apple trees will give us varieties so different in time of ripening and in keeping qualities as to furnish our apple a day all the year round. Furthermore, there will be one variety which will always be used when we wish apples baked; another which will be used to make a smooth sauce; another when the cook wishes to bake a pie in which the slices maintain their identity, etc. These are inherent differences bred in the tree and will be characteristic of all the fruit which the tree produces. These processes of differentiation through selection and breeding have gone so far and have given us so many distinct types and varieties adapted to different uses that we can hardly expect the progress of the last fifty years to be duplicated in the fifty years to follow.

### INCREASING PRODUCTIVITY

We have accomplished almost as much in increasing the productivity of certain desired breeds and varieties, particularly the milk and butter yields of the dairy breeds of cattle, the numbers of eggs laid by certain breeds of fowls, and the yields per acre of certain grains, roots, and tubers, upon which attention has been centered. But on the whole it seems that the plant breeders of the last generation have gone further in giving us new and

specially adapted types which cater to a market which is constantly growing more discriminating than in developing these specialized types to their highest possible productiveness. Possibly the greatest advance of the next generation will be in the latter direction.

### SURPLUS PRODUCTION

However, the present problem of American agriculture is the problem of surplus production, and the increasing yields of animals and plants of highly developed breeds and varieties have contributed tremendously to the production of this surplus. Of course a domestic surplus of grain or meat would not be a problem if our farmers were permitted to produce it under a system of unhampered international economic competition, which means at a cost of production not artifically increased by national legislative policy. But since we seem to have decided upon tariff and immigration policies which result in higher costs of production than obtain in most other countries, the increased efficiency of our farmers and of the breeds and varieties of animals and plants which they produce tends to aggravate the difficulty in the case of every farm product of which we produce a surplus which must be sold abroad in competition with like products of other countries.

### REPRODUCTIVE PROCESSES

Broadly speaking, we may say that we have standardized our production through natural and selective processes until we have breeds and varieties which are regarded as preëminently qualified for specialized uses and are therefore standard and dependable sources of supply for these particular purposes. We may even say that we do not seem to be suffering from any marked inefficiency due to the lack of breeds or varieties adapted to meet any well defined existing demand. Civilization grows ever more complex and this process of specialization and differentiation must inevitably go on, but it does not seem likely that its economic effects will be much more pronounced in the near future than they now are.

Every scientist and even every observant farmer knows that there is a tendency in nature to revert toward original types. If we are negligent in continuing those processes of selection and in providing the peculiar environments which have produced a particular breed or type, we soon find a large proportion of the progeny losing some of the desirable characteristics of their immediate ancestors. Nature seems to regard man's improvements upon her processes with much skepticism, and is not inclined to preserve with any great fidelity the specialized or extreme types of plants and animals which he has produced. Among the most highly developed breeds of fowls and animals we still have a considerable number of individuals so lacking in the particular characteristics desired that they must be separated from the breeding flock or herd and sold for what they will bring. Perhaps it is not too much to hope that our increasing knowledge of heredity and genetics will enable the farmers of the next generation to produce selected or standardized strains of plants and animals with a smaller percentage of disappointing individuals for it is by no means probable that we have reached the limits of possibility in standardizing the results of reproductive processes.

The time may come when eggs can be put in the incubator with the same confidence with which wet bricks are stacked in the kiln, a confidence that the fowls to be reared from these eggs, when mature, will be as much alike in all their qualities as will the bricks from the kiln after they are laid in the wall.

But every breeder knows that we are yet far from that goal. The difficulties of securing and maintaining uniformity in appearance and in economic excellence are far greater in the breeding of farm animals than in the breeding of poultry. We are still far from the day when we can predict with any certainty concerning the heifer calves from a pure bred herd just what their individual or collective producing capacity will be. Obviously, the appearance of recessive characteristics or traits is to be expected more frequently in the progeny of unrelated parents than in crops grown from the seeds of self-fertilizing plants. We have then a field for scientific research in the further standardization of our improved plants and animals through the more permanent fixation of their desirable, inheritable characteristics. Every step of progress in this direction will be of direct financial advantage to the intelligent farmer, and of economic importance to the entire consuming population.

If plant and animal breeders are equally successful during the next generation in fixing more firmly the desirable characteristics of improved breeds and varieties, there will remain as there are today, more numerous and intricate problems in standardization for commercial purposes of the plant products than of the animal products. A calf of good beef breeding through poor feeding and neglect may weigh only half as much when a two-year old as he might have weighed, but if he is then properly fed, fattened, and finished, his conformation and quality may be about as good as they could ever have been made. This would be true of a large herd of beef steers similarly treated.

### INFLUENCING FACTORS

But let a crop of oats of the greatest promise, bred from the finest selected strain, be subjected to two weeks of excessive heat and drought at a certain stage of its development and no amount of subsequent rain or favorable weather can induce the plants to mature grain of the weight per bushel or quality that they would have produced under continuously favorable conditions.

One or more of the qualities which determine the price of grain of a given variety may be influenced by the general climate of the locality, the physical condition of the soil, the chemical content or amount of plant food available, the season of planting, an unusual amount of rainfall, an unusual scarcity of rainfall, an unfortunate distribution of rainfall, or by many different sorts of insect and disease injury. After a crop of small grain is matured other things may happen to affect its market value. There may be unfavorable weather discoloring the ripened or harvested grain in the field, or causing some of it to sprout before threshing. There may be an admixture of weed seeds or wild onion which will not be separated by the ordinary threshing process. There may be inefficiency in the cleaning apparatus, giving rise to excessive dockage. Finally, the grain may be threshed while the moisture content is still too high and may heat in the bin, car, or elevator.

Every one of these conditions will affect the commercial grade of the grain and may cause the lot to be worth less per ton or bushel than it would otherwise be. If several of these adverse conditions exist or have exerted their influence on the grain, it cannot be classified into any of the recognized commercial grades now in use, but must be sold on sample, the price being fixed by the judgment or the bargaining power of the buyer.

Commercial standards have been devised under which the greater part of

our grain crops can be marketed. Additional grades could be established to take care of certain qualities which must now be sold as "sample grade." But usually the defects or injuries which result in reducing grain to what we now call "sample grade" are so serious that the buyer wants to see a sample before naming his price. What is true of grain is broadly true of some of our fruits and vegetables which, when failing to meet the requirements of specific grades, must now be sold as unclassified.

The refinements of modern commerce tend to give us a constantly increasing number of grades. Probably some qualities which are now mingled in sample grade, unclassified, or culls, will be separated, authoritatively described and given grade names, thus making it possible to buy and sell them without examining samples. As the trade becomes more discriminating, there is a tendency to pay different prices for the best and the poorest included within a given grade. When this becomes the habit of any considerable number of traders there is a commercial need for a new grade which shall include either that part of the old grade which brings the higher or the lower price. Commercial grades are measures of value, and commercial grading cannot create value except as it creates convenience in trading or in final use.

Standards or fixed grades for agricultural products are essential to satisfactory future trading. There are, of course, differences of opinion as to whether the general effect of trading in future contracts is desirable or undesirable from the point of view of the producer. Repeated attempts in Congress to secure repressive legislation have failed, but the principle of Federal regulation of exchanges organized primarily for future trading in agricultural products is now well established. It seems reasonable to expect that the regulatory acts now in effect will be modified in the light of further experience, and that future trading under such regulation will continue indefinitely. Congress has established by law the grades for cotton and grain, but has not made mandatory the Federal grades for products which are not sold on the future exchanges.

### KINDS OF STANDARDIZATION

The standardization of farm products is of two kinds, or is the result of two very different processes. One is a process of classification by comparing the commodity in question with a series of actual or imaginary samples having specific qualities or combinations of qualities and defects; the other is a process of grading by which different qualities are physically separated until each conforms to the requirements of a definite standard.

Cotton is classified and not graded. A sample from the bale is examined and on the basis of its color, freedom from foreign matter, and length of staple, it is given a certain classification often called a grade. But nothing which the farmer can do to his bale of cotton will either raise or lower its grade unless by exposure to the weather he allows it to become damaged. But the potatoes in the farmer's bin as they have come from the field are not graded and will seldom meet the requirements of any grade. If they are to be sold as U. S. No. 1 they must be subjected to a process of separation. They must either be picked over by hand or they must go over a machine which will take out those below a certain minimum diameter, and in addition most potatoes will require the removal by hand of a considerable number of defective specimens if the lot is to meet the quality requirements of the U. S.

No. 1 grade after the separation for size has been made.

Nearly all fruits and vegetables must be similarly graded, whereas grain grading, so-called, is like cotton grading—simply a process of classification. However, in the case of grain the grade may be raised by mechanical processes. Its moisture content may be reduced by mechanical handling and aeration, and at the same time dockage or foreign matter may be removed. The result may be to increase the weight per bushel while decreasing the moisture content and the percentage of foreign matter. After this process the grain may fall into a higher grade than before. However, the rehandled lot is still classified in accordance with specific descriptive requirements.

Meat animals may be graded somewhat as are fruits and vegetables by separation into different lots which are fairly uniform as to age, sex, size, breed or conformation, and condition or fatness. Such grading gives even running lots which are attractive to buyers who desire carcasses to meet the requirements of specific demands, uses or markets. They facilitate trading and for this reason the shipper who grades his livestock into even running lots may be well paid for his trouble. However, he has created no value except the value of convenience.

The farmer of today who does not deal immediately with the retailer or consumer, but who puts his products into the ordinary channels of trade may rest assured that these products will be graded or classified before they reach the consumer. If he sells grain, cotton, wool, tobacco, or other raw products for manufacturing processes, someone will classify his lot, or more likely subject it to processes which will separate it into different lots of differing values. Just how much of the increased value due to this separation and classification the farmer may obtain for himself is a question which he may well consider.

Since the organization of the original Office of Markets, later the Bureau of Markets, now merged in the Bureau of Agricultural Economics of the Department of Agriculture, the theory has been held officially that the producer is likely to be the loser when he sells his products without a definite knowledge of their grade or classification, or without any effort to separate his crop into different grades if his production is large enough to give him more than one grade or classification in commercial quantity. There is abundant evidence that in the case of many products the presence of a small quantity of deteriorated or defective grains, fruits, or other units, will cause the whole to sell at such a discount that someone will be exceedingly well paid for the labor of separation, hence the slogan "Keep the culls at home."

Usually labor is cheaper on the farm than on the city market or in the factory, so farmers have been urged to subject their products to whatever processes of mechanical or hand separation may be practical on the farm or at the point of shipment with a view to increasing salability and market value. In some parts of the country and for some products this is being done as well as we may reasonably expect to see it within the next generation. The fruit industry of the Pacific Northwest is an example of rather complete standardization at home. With reference to other crops and commodities more remains to be done, and it may become possible for the producer to do it at a profit. The sweet potato crop of the Gulf States appears to offer such an opportunity. We must admit, however, that if such standardization is carried to commercial perfection the farmer will simply be selling more care and labor. He will not be selling more food.

# The Standardization Program of the Agricultural Coöperatives of the United States

By R. W. Balderston

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**"Agriculture has been the last of the great industries of the United States to adopt a general program of standardization."[1]**

THIS statement of Mr. W. F. Allewelt at the Institute of Coöperation is neither new nor startling, even to those only remotely acquainted with the so-called agricultural situation, but it indicates one of the fundamental facts that must be solved before agriculture can become permanently prosperous. Mr. Allewelt, however, went on to point out that substantial progress is being made. He says:

Nevertheless, during recent years, the growers and handlers of agricultural products have come more and more to the realization that adequate standardization is one of the things we must pay for, whether we have it or not, and, in fact, that the penalty in dollars and cents for its neglect usually exceeds, by a considerable margin, the cost of a properly operated standardization program. This has been demonstrated, clearly and repeatedly, by many coöperative and commercial marketing agencies that are recognized as outstanding successes in their fields.

In defining the standardization of agricultural products, Mr. Allewelt says:

In its broader sense, standardization includes the proper correlation of production with environmental conditions and market requirements. By this I mean that the commodities and varieties produced must be adapted to the districts and soils from which they come, and suitable to the needs of the markets where they are to be distributed and consumed. It is relatively a simple matter to standardize products which are well grown and carefully handled, but extremely difficult to put out, from poorly grown or carelessly handled crops, a supply which will meet the reasonable demands of distributors and consumers, or procure any remunerative returns.

For a long time some measure of standardization has been observed by individual producers, this being considerably extended and strengthened by the marketing agencies. Official state and federal standardization has been a comparatively recent development, mostly within the last twelve to fifteen years, because of the need of systematization and correlation of these activities on a state-wide and national, or international scale.[2]

At the same conference, Mr. F. W. Read gives a very clear analysis of the purposes of standardization:

The first and basic objective of standardization of farm products, therefore, is to enable the sales manager to turn the commodity into cash returns that show a reasonable profit, and all other objectives, in the last analysis lead up to or are allied to this fundamental. But to dismiss the subject of standardization with this generality would be a gross injustice, and in the complexity of modern merchandising there are other and immediate problems that must be considered. Most of these problems

[1] W. F. Allewelt, Chief of the Bureau of Fruits and Vegetable Standardization, California Department of Agriculture, Sacramento, Calif. American Institute of Coöperation, 1928, Vol. II, p. 8.

[2] From American Institute of Coöperation, 1928, Vol. II, p. 8, "California Standards for Fruits and Vegetables," Allewelt.

have been brought about by increasing production, with consequent increasing competition.[3]

Mr. Read goes on to say:

> In the last analysis, the American consumer will buy for quality, and quality is standarization. The price is secondary, if quality is outstanding.[4]

If the organization be large enough to have widespread distribution, a standardization of agricultural products may be effectively carried out by a large processing or distributing corporation without consciously organized producer coöperation. The "Brookfield" butter of Swift & Company is a good example of this kind of standardization. Likewise, in some fields progress in standardizing has been mainly through governmental supervision and regulation. In the butter market, at the present time, it is the scoring by United States butter inspectors which has brought standardization to butter quotations throughout the country.

## WORK OF THE COÖPERATIVE

This paper will deal primarily with but one phase of this development, namely, with the significance of the standardization programs of various groups in the agricultural coöperative movement.

Many coöperative marketing associations have some very fundamental standardization programs. They are able to accomplish things in the standardization of quality of farm products that cannot be done by any other agencies. In these days of overproduction of farm products, they are demonstrating how to solve one of the economic problems of present-day agriculture and are perhaps pointing the way for an ultimately satisfactory solution of some others. Agriculture is still suffering from the post-war depression or maladjustment of values, it is true, but careful observers also now agree it is suffering from serious overproduction due to greater efficiency of production with no compensating marketing opportunities.

Careful students are willing to predict that just as these coöperative groups are solving problems of standardization of quality, even so they will lead the way in the ultimate adjustment of quantity of production of agricultural products so that they may not seriously exceed the demand and a resultant unmarketable surplus be an economic millstone for the necks of the farmers who produced the crops.

Discussing the important place of "coöperation" in the modern development of agriculture, Dr. Charles R. Fay says:

> The giant strides that have been made in the coöperative movement since the termination of the World War entitle us to apply to the modern development, the phrase, "Agricultural Revolution," which revolution, at last, is bringing the products of the producer, the farmer, into line with the earlier advance of commercial and industrial units. Industrial revolution that opened with the age of steam power divorced agriculture from industry, and until the farmers learned, through shrewdness or necessity how to combine, they were very much in the position of the wage earner without any organization. Just as the wage earner, by collective bargaining organizations, or in some cases by generous treatment of his employer, has found how to obtain the full equivalent for his efforts, so also it is with the agricultural producer. Natural science came along and showed the farmer how to multiply production, and so production got ahead of efficient distribution. He is now in need of economic science; not the economic science of profes-

[3] F. W. Read, Manager of Standardization Department of the California Fruit Exchange, Sacramento, Calif., "The Objectives of Standardization," American Institute of Coöperation, 1928, Vol. II, p. 3.

[4] American Institute of Coöperation, 1928, Vol. II, pp. 7–8.

sors, but economic science based on a wide plan of purely genuine practice. By economic science, he must now take care of the vast increase in production which natural science has enabled him to extract from the soil.[5]

At the same session of the Institute of Coöperation, Mr. Chris. L. Christensen explained that the original purpose of the coöperative butter creamery movement in Denmark was that of obtaining a standardized product. Mr. Christensen said:

The present system of coöperative marketing in Denmark that you hear so much about started in 1882, and came as a result of a marketing problem. The Danes had set about to change from gain production to dairying in the seventies. This change in agriculture soon resulted in a surplus of butter which the Danes were attempting to market in England.

Before the advent of coöperative marketing, Danish butter was sent to Great Britain, the principal market for Danish butter, in lots in which there were hundreds of batches of ungraded butter.

The Danish farmer found that, to place a product successfully on a large market, the product should appear on the market in a large quantity and should be of one fairly uniform grade. The English butter traders not only wanted butter shipments in larger quantities of one grade, but they offered higher prices for shipments of graded product.

The marketing problem confronting the average Danish farmer in the seventies and eighties is illustrated by the experience of a small farmer on the Jutland Peninsula with a herd of six cows. He sent his butter to a large Butter Exposition in London and won the first prize. But this recognition on the world butter market did not give him a higher price for his small weekly butter production. Like many other individual farmers who sent only small amounts, he did not receive the top price, regardless of the fact that he was selling a premium quality butter. His butter was bought by the local storekeeper and later sent to Great Britain by the exporter in large lots in which there were hundreds of batches of ungraded butter, with the result that the farmer who produced a premium quality butter was not paid a premium price, but a flat price based on the market price for these lots of ungraded batches of good and poor butter.

While it is true that many farmers then produced a high-grade butter, it is equally true that it was not practical for these farmers to attempt to market their small batches of butter individually on the British markets.

The problem of supplying a lot of quality butter, of a standard grade, was one which had to be solved at the point of production. This the Danish farmers did by the establishment of the coöperative creameries through the agricultural districts, where the entire milk production of the community is assembled and manufactured into a standardized quality product so it can be properly merchandized.[6]

So you see these clever Danish farmers were applying Dr. Fay's remedy to their problem. By the use of "natural science" a fine product could be produced but it was necessary to apply "economic science" to secure a *standardized* product that could be merchandized to advantage.

How well these Danish coöperatives have succeeded is shown by the fact that Danish butter now tops the London market.

This development in the science of merchandising was at first, and for many years, a coöperative activity of the farmers, entirely independent of the Government. Later the Danish Government recognized by law the brand

[5] Dr. Charles R. Fay, Professor of Economic History, University of Toronto, Toronto, Canada (late of Cambridge University, England), "American Coöperation," 1925, Vol. I, p. 92, "International Aspects of Agricultural Coöperation."

[6] Chris. L. Christensen, in charge Division of Agricultural Coöperation, United States Department of Agriculture, Washington, D. C., "Dairying and Coöperation in Denmark," American Institute of Coöperation, 1925, Vol. II, pp. 42–43.

or trade-mark of this fine coöperatively made butter, fixed standard specifications for the use of this "Lur" brand and directed that no butter should be exported that did not meet these requirements.

By employing trained technical experts to make the butter, and insisting on the farmers' delivering a high quality of milk to the creameries, the Danish creameries have been able to produce a uniformly high quality butter year after year. At the present time, over 80 per cent of all butter made in Denmark qualifies for the "Lur" brand for export (butter scoring equal to or better than 92 score butter in the United States).

Regarding the influence of standardization in the success of Danish agricultural coöperation, Mr. Hogsbro Holm[7] says:

> The standardization of Danish agricultural produce has been a great benefit for the sale of Danish agricultural produce, for export as well as for the home market. Danish agriculture is still improving its scheme of standardization and trying to find the most practical lines for coördinating its system of production, its system of standardization and its system of selling its products mostly through coöperative organizations. Through the coöperative system Danish agriculture has made the large and the small producer in the same degree interested in the right way of standardization of their products, because they are all getting the same price for the same quality of the standardized product.

A comparison of the tables of contents of the sessions of the Institute of Coöperation for 1925, 1926, 1927, and 1928, shows very graphically the increased emphasis on standardization in the discussions of the problems and accomplishments of the various commodity groups. In 1925 there were as above quoted, some very frank statements from the professorial experts as to the importance and value of standardization work for the "coöperatives"; likewise, there were a few such titles as "Organizing for Standardization of Butter" and "Organizing for Milk Standardization." But in reviewing the reports of these addressers, it is evident that the thought was largely that of the form of organization to use, rather than the technique or the philosphy of the standardization program itself.

At the 1926 session there was a very considerable proportion of the program devoted to subjects directly related to or allied with the question of standards.

In 1927 the standardization of products was a prominent subject discussed in connection with practically all commodity marketing projects.

At the University of California, in 1928, was held a special series of conferences on "Progress and Problems of Standardization." In its deliberations, the Institute considered the standardization methods used with respect to such products as: fruits and vegetables, walnuts, dried figs, dried peaches, dried raisins, dried prunes, olives, dairy products, eggs, wool. (Livestock, cotton, tobacco and grain, it will be remembered, are not important products in California.)

## THE "LAND O' LAKES, INC."

During the past few years there has been much discussion respecting the newly organized, Land O' Lakes Creameries. Its merchandising policies have been variously interpreted by its competitors and its friends.

The coöperative creamery movement in Minnesota is not by any means new. Of the six hundred and forty such creameries in that state, over five hundred have been in successful operation for thirty years or more. These local coöperative plants are all butter cream-

[7] Secretary of the National Council of Agricultural Organizations.

eries averaging about two hundred and fifty farmer patrons per creamery and manufacturing about 250,000 pounds of butter each, per year. The "Land O' Lakes" was organized in 1921 and is a central service and marketing organization, owned and operated by more than four hundred of these local coöperative creameries. The purpose of this central federation is best told in the words of Mr. A. J. McGuire, at the Institute of Coöperation in 1927. He says:

Now the first purpose of these creameries getting together was to standardize the product and improve its quality. When the local coöperative creameries first started operating in Minnesota they made good butter, because the milk was separated in the creameries. The milk had to be fresh and sweet in order to separate it, and it was an easy matter to make good butter out of the fresh product. Up to thirteen years ago, all the butter for twenty years was scored extra. They gained the reputation of making the best butter in the world. Butter made in coöperative creameries in Minnesota was sent to Paris (Exposition) and won in competition with the whole world. That was in the days of the whole milk creameries.

Then the hand separators came in; the cream was kept on the farm for two or three days of a week, and the quality of the butter started downward.

The creameries realized they were losing on that account. Their competitors were beating them, because they were making as good butter and had a better system of marketing.

The coöperative creameries got together to see if they could not use the same good business methods as their competitors. The first thing they did was to start out to improve the quality of their butter, and to do that they established a system of inspection or grade, whereby the butter would be graded and scored by an impartial judge.[8]

[8] A. J. McGuire, General Manager of the Land O' Lakes Creameries, Inc., Minneapolis, Minn., "Quality Improvement Work," American Institute of Coöperation, 1927, Vol. II, p. 351.

Largely because of a growing national recognition of governmental butter standards, the "Land O' Lakes" official persuaded the United States Department of Agriculture and the State Department of Agriculture to coöperatively provide inspectors for their butter. United States "93 score" was adopted as a standard grade.

Mr. McGuire further says:

The farmers decided to have a brand for their butter. They offered a prize for a name to be selected. The name, "Land O' Lakes" proved to be a very fortunate name, because it is symbolical of that country. We have 10,000 lakes in Minnesota, nearly as many in Wisconsin, a few in Iowa. This name they started advertising.

All kinds of literature have been provided and sent out to the farmer, explaining the way cream should be kept on the farm. The first principle is to have the cream cooled immediately, for, next to cleanliness, is the importance of cooling of cream in cold water immediately, and keeping it in cold water until it is delivered to the creamery. Four times a week delivery is required for the making of Land O' Lakes butter, and here we explain the system of caring for the cream and giving an illustration whereby a farmer can use his windmill in pumping water for stock, put a tank between the well and the stock tank, in which all the water passes, a convenient way for cooling the cream.

The agreement of the creamery to grade the cream and pay a premium for sweet cream according to the same standard was a tremendously important factor.

The creameries had been working along for over thirty years, and the majority of the buttermakers were sincere and honest in their desire to make better butter, to grade cream better, but the stumbling block was always this, "If I grade cream and if my neighbor's creamery does not grade, a great number of my patrons will go over to the creamery that does not grade."

Creamery after creamery made an attempt to make better butter, but with the competition of the cream station and neigh-

bor creamery they could not grade it and said it could not be done.

One of the first rules of the Land O' Lakes was that the cream was to be graded at the creamery. Under the old system that still prevails in the manufacture of butter throughout most of the United States, cream was cream, and commanded the same price regardless of its condition. That was formerly the condition in Minnesota. They would pay on the butter fat basis, but not on the quality basis.

It was agreed that all cream should be paid for according to grade, a premium of not less than three cents per pound of butter fat, to be paid for cream that will test Land O' Lakes requirements.

Land O' Lakes employs at the present time over twenty fieldmen to work among these creameries. We have a fieldman for each of the eighteen districts in the state.

These fieldmen are all expert buttermakers. We select men who are the most successful creamery operators, men who were making excellent butter, and successful in getting the farmers together in harmony. In other words, each fieldman had to be a first-class buttermaker and a first-class leader in the community.

They also receive a copy of this government inspection report, and when the inspection shows a poor quality, the fieldmen then go around to the creameries, and locate the trouble and encourage improvement of the quality.

Through the work in the Laboratory, and through the work in the field, instead of 30 per cent of the butter scoring 93, as at first, as high as 71 per cent has been scoring 93. This past month 63 per cent of the eight million pounds and over, we handled, scored 93, Land O' Lakes standard, an additional 15 per cent scored 92, so that instead of 30 per cent or less being good butter it is now up to 75 and 80 per cent, very good butter. This result has been brought about by the creameries working together.

So much for the quality program based upon Government inspection.[9]

[9] A. J. McGuire, General Manager of the Land O' Lakes Creameries, Inc., Minneapolis, Minn., "Quality Improvement Work," American Institute of Coöperation, 1927, Vol. II, pp. 356 and 357.

## FLUID MILK COÖPERATIVES

Standardization of milk for fluid consumption presents a number of problems and factors that are quite different from those attending the marketing of most agricultural products. First of all, in modern practice the boards of health of the United States exercise increasingly careful sanitary supervision of the production and distribution of fluid milk for consumption under their jurisdictions.

Again, fluid milk cannot be graded as can wheat or potatoes. It can be selected as to conditions at source and in transit and as to guarantees of purity and sanitary care, but the consumer must rely on these guarantees, plus, to some extent, his own taste in the selection of particular grades or classes of milk rather than on measurable standards that obtain in the grading of such products as butter, or apples, or oranges.

However, coöperating carefully with the boards of health responsible in its different markets and operating under their rules and regulations, one fluid milk coöperative, the "Inter-State Milk Producers' Association of Philadelphia," has taken up milk quality standardization in conjunction with coöperating city distributing companies. The Inter-State Milk Producers' Association has over 20,000 member dairymen, located in Pennsylvania, Delaware, Maryland and New Jersey, who market their milk in the Philadelphia metropolitan area and secondary markets in the Philadelphia Milk Shed.

This work was explained by Mr. C. I. Cohee, Director of the Quality Control Department of the Philadelphia Inter-State Dairy Council at the Institute of Coöperation of 1927. He explained the operation of this standardization program as follows:

Philadelphia is unique in one respect in that the quality of milk is controlled by a coöperative organization entirely. Pittsburgh has a similar program, but not quite as complete as has Philadelphia. In Philadelphia, the Dairy Council, which is purely a coöperative movement, sponsored by both the Milk Producers' Association and distributors in that territory, has complete charge of the quality program in that city.

Several years ago the Inter-State Milk Producers' Association felt that one of the first steps for marketing milk successfully should be to improve the quality of the product, and it therefore agreed to a quality program for milk. The dealers were quick to embrace an opportunity of that kind, particularly when the farmers were offering to pay at least a portion of the bill, and so it came about that the Quality Control Department was organized by the Inter-State Milk Producers' Association to be operated in conjunction with the dealers, so that the two groups were financing the movement on an equal footing.

For two years representatives of the Quality Control Department went about the territory of the Philadelphia milk shed holding farmers' meetings and seeking means to improve the quality of the milk.

Two years of such work brought the development to the point where it was felt that we should go a step further. A committee of farmers being appointed, it drew up a set of regulations. I do not know whether anyone here has had the experience of working under a set of regulations prepared by a committee of farmers, but I want to say that our committee of farmers drew up a very good set of regulations governing the production and distribution of milk. Their regulations are in keeping with those enforced by boards of health in various cities of the United States.

The Inter-State territory is quite a large territory from the standpoint of a milk shed, covering forty-one counties, located in portions of five states. It was quite a serious problem to tackle the control of milk supply from such a large area. The territory was divided into nine districts, eight sub-districts, and the home district of Philadelphia. The fieldman in each one of these subdistricts is responsible for the quality of the milk in his particular territory.

I think our organization is fortunate in the selection of the men to do this work. We were very careful as to what type of men should be employed. We are quite proud of the group that we have in the Philadelphia territory doing milk improvement work today. In the first place, every man is a farm boy, brought up on a dairy farm and knows how to do any work that may develop on an ordinary farm.

These men, in addition to being born and reared on dairy farms, are all college men. Every man that we have has had a special training for the work. So we do not refer to them as milk inspectors, but rather as field representatives.

Dealer plants were also carefully inspected to see that they met minimum requirements which were set by this same committee of farmers and dealers. All were required to have proper machinery, proper equipment, proper lighting, ventilation, etc. Many of our milk plants did not pass inspection in some of these particulars, but in the course of time all such situations were corrected.

One of the things that pleased me happened about two weeks ago. One dealer made the statement regarding the milk that they were receiving during the year of 1926, that the bacteria count of the raw milk was only 25 per cent of what it was during the year of 1923 and previous to that time, showing there has been a decrease of approximately 75 per cent in the bacteria count in the milk. So milk improvement work does bring results.[10]

On June 1, 1928, as a result of this work of quality improvement and standardization, every one of the 20,000 shippers had a "permanent permit," which signified that his farm condition met the minimum requirements of the code. Since that time the Quality Control Department has been

[10] C. I. Cohee, Director Quality Control Department of Philadelphia Inter-State Diary Council, American Institute of Coöperation, Vol II, 1927, pp. 313, 314, 316 and 317, "Maintaining Quality in the Milk Supply."

experimenting with a "direct count" method of bacteria control which it is hoped can be used to further standardize the quality of the product sold by the Association.

The above is but an example of the thought and attention which fluid milk coöperatives of the United States are giving to this question of quality standardization. In some associations which are equipped to do processing and distribution of milk a high standard of quality is maintained throughout. Whether the fluid milk coöperative be organized as a collective bargaining agency or on the so-called "pooling" plan, the results would seem to be in each case, that a coöperative association is able to secure producer interest in the important matter of standardization. The fieldmen of the coöperative are looked upon as counselors. Regardless of the methods of inspection the full support of the producer may be secured by coöperatives because the farmer member feels that he has, and rightly so, a personal interest in the quality of the product as it reaches the consumer.

### CRANBERRY STANDARDIZATION

As an example of the method by which a standardization of product is effected through a coöperative association, let us consider the American Cranberry Exchange with members in New England, New Jersey and Wisconsin.

The cranberry industry in the United States is one closely circumscribed as to areas: a chief one in New England, a smaller one in southern New Jersey, and a still smaller one in Wisconsin. The peculiar characteristic of a cranberry bog as to soil, climate and water control are not important in this discussion, but they do very closely restrict the industry. However, growers in these areas have developed and are growing over three dozen recognized and well-defined varieties. Some ninety-four different sales brands have been adopted by cranberry packers and have become generally recognized in the trade. In selling under all these brands a very difficult problem in standardization has been presented to the American Cranberry Exchange.

To handle this problem the Exchange issues to each grower through its three district sales companies a book of rules and regulations. This code provides very explicit rules for sorting, storing, packing, and shipment, and then gives detailed directions as to the varieties and the condition of the berries in each variety that may be packed under the respective brand. Furthermore, each buyer in the trade is given a detailed guide of "varieties, grades, and brands," so that in purchasing he may be intelligently guided to select the berries that best meet his particular needs. At the same time, all of the higher grade brands are labelled "Eatmor"—the trade-marked standard brand of the Exchange, one that it has introduced successfully through national advertising.

Any program of standardization presupposes careful inspection. In reply to the question, "What is your machinery for inspection to insure that all products are in accordance with standards and grades?" Mr. A. U. Chaney,[11] the general manager of the Exchange, states that they have field inspectors constantly on the job—one inspector for such a district as he can cover in a day.

Mr. Chaney further said with regard to the value of the standardization program in the American Cranbery Exchange, "We consider standardization of our grades the key to our success."

[11] Mr. A. U. Chaney, General Manager, American Cranberry Exchange, 90 West Broadway, New York, N. Y.

### CHEESE STANDARDIZATION

Until very recently the American cheese industry, considered as a whole, was in a very disorganized condition. Quality standards were at a very low ebb. Out of this situation loomed a small yet very bright star of hope—the Tillamook County Creamery Association of Oregon. It began to sell a standardized high quality cheese, that, under the "Tillamook" brand, soon received recognition in the trade and with consumers far out of proportion to the size of the enterprise. The financial returns to the members of the Association each year showed the value of a sound merchandising policy with high quality products.

Mr. Carl Haberlack, the secretary-salesman of the Association was asked some questions, identical with those asked of Mr. Chaney of the American Cranberry Exchange. His answers are equally enlightening.

1. We have promulgated our own grades on cheese. These are strictly adhered to. Last year our production of second grade cheese was less than one half of 1 per cent, and this sold within 5 cents of our regular prices.

2. (a) We have in this county a dairy herd inspector whose duties are substantially shown in his title. He inspects the various dairies and cheese factories regularly.

(b) We also have a county veterinary who inspects all the herds in the county, something over 15,000 cows, twice a year. Last year there was only one tuberculosis re-actor in the entire county, and some of the years there have been none. He is paid partly by the county and partly by the dairymen.

(c) We have a cheese inspector who has been with us since 1909. He inspects one cheese out of each batch made by the nineteen factories which comprise this Association. He also instructs the cheese makers in case they get off quality.

3. We consider the program for standardizing a product of the very highest importance. Without such standardization we would have to take the ordinary price governing on cheese. For instance, we are today getting 27 cents and 28 cents for our cheese f. o. b. Tillamook, while other Oregon cheese can be had at 4 cents to 5 cents under our prices. This is largely the result of standardizing our product and advertising the same to the consumer. Also, we store our surplus from time to time so that we do not have seasonal gluts. Our price ranges from 24 cents to 28 cents this year, which is in sharp contrast with Wisconsin prices. These have been only five changes in prices of our production this year, being two declines and three advances.

### STANDARDIZING CITRUS FRUITS

Everyone knows "Sunkist" oranges, lemons, and grapefruit. But how many consumers know or care that these citrous fruits are coöperatively marketed through the California Fruit Growers Exchange? Very few! But *all* consumers are interested in the uniform quality of the oranges that they buy and it is this fundamental need and demand that the Exchange is so successfully meeting.

The integrity of the "Sunkist" brand and the standards of the product are protected by the Exchange with great efficiency. Very explicit rules are promulgated for the use of this brand, as well as other brands in use by the Exchange. The size and condition of the oranges, lemons, and grapefruit is carefully specified, likewise the methods of packing and shipment. The specific problems of merchandising citrus fruits in a broad, national way must, from necessity, be quite different from those of a cranberry exchange or a local group of cheese factories. However, the statements given by Mr. Paul S. Armstrong, Assistant General Manager, are remarkably similar to those of the managers

of other commodity coöperatives. He says:

1. The California Fruit Growers Exchange is a marketing organization comprising 11,500 growers, grouped into 200 local packing associations which in turn are grouped into sub-exchanges. Each of the units is a corporate entity and the Exchange, therefore, is in effect a federated selling agency for its 200 member associations.

This industry has set up grade standards of its own and the use of "Sunkist" and "Red Ball" brands owned by the central exchange are permissive upon a maintainance of certain grade standards established by the central and enforced by its Field Department.

2. The Field Department of the Central Exchange maintains a force of from twenty to thirty field inspectors who visit the 200 packing houses with practically daily regularity throughout the shipping season of each. In addition to advisory counsel on packing-house handling methods, these inspectors are charged with the responsibility of maintaining the "Sunkist" grade specifications. Uniformity of inspection is aided by supervising inspectors who contact frequently with the individual inspectors and also by the field manager, who is in close touch with the general situation at all times. This is handled on a coöperative and educational basis rather than a policing basis, but sufficient authority is given in the regulations, to completely enforce them where necessary.

3. We consider proper grade standards and consistent pack fundamental to successful marketing. Only by this means can the trade and the consumer buy with confidence. One of the most striking accomplishments of coöperative marketing in the interests of both the producer and the consumer is the ability of the coöperative group to establish and maintain a suitable program of standardization.

### UNDERLYING PRINCIPLES

The reports and comments of these business executives disclose several very important facts based on actual experience.

First. That a standardization of product by coöperatives need not wait for governmental activity. Governmental regulations have very great value to the trade. Many coöperatives, however, find that they can very often conduct successful standardization programs which they themselves have devised to meet their individual needs.

Second. The well-organized and efficiently managed standardization program of these "coöps" is an integral part of a sound production and merchandising program, which through "economic science" is producing results which compare favorably with the results secured by groups in industry, working, as they do, under controlled factory conditions.

Third. The coöperative method of marketing can secure producer coöperation and interest in high quality products in a way that old line collecting and distributing agencies cannot possibly attain. This factor, alone, is sufficient, not only to justify the coöperative method of marketing, but it is of real advantage to consumers in solving one of the great problems created by the complexity of our modern world, the distribution of the necessities of life.

Fourth. Coöperative agricultural marketing is not simply a new and novel type of marketing agency. It is, on the other hand, a way of living and doing business. Some early enthusiasts for agricultural coöperation thought of it as a means of cutting out the "middle man." On the other hand, pessimists or prejudiced critics predicted that the movement would soon fall of its own weight, because "Farmers are not business men." We now know, that neither of these predictions has proven correct. Coöperation has not cut out the "middle man," though it has in many cases reduced the cost of distribution. However, the success in coöperative marketing has been shown

to be fully as great, if not greater than that of individual or corporate business enterprises. Coöperative marketing has developed lines of service, and economic possibilities that were not thought of when the movement was first gaining recognition in this country; and one of these is the fact that the coöperative marketing organization reaches back and affects the whole business set-up of the individual member of such an association. Another is the fact that it helps integrate in a practical, permanent way, agencies which have been set up to aid the farmer in developing modern scientific agriculture.

In discussing "The Economic Aspects of Coöperation" in 1925, Dr. J. D. Black, said:

> The economic possibilities of coöperative marketing are enormous. I have much respect for many of the achievements of the so-called "big business." But, on the other hand, big business makes many mistakes and misses many of its opportunities. Many big business concerns could learn much to their advantage from a few of our best coöperatives. Our coöperatives are, on the whole, more open-minded than big business, more willing to listen to suggestions, more inclined to experiment and carry on research work.
>
> Thus the coöperatives enjoy one distinct advantage over big business trying to operate with their products, namely, that if they are properly organized and managed, they have much better access to the growers and can secure more coöperation from them. The growers can recognize a better chance of profiting from improvements in quality of their products, when they sell them through their own association, than when they sell them into private hands.[12]

Carrying the subject still further, he made a very significant observation and prediction:

[12] Dr. John D. Black, Head, Department of Agriculture Economics, University of Minnesota, St. Paul, "Economic Possibilities of Coöperation," American Institute of Coöperation, 1925, Vol. I, pp 88, 89 and 90.

It has been said the coöperation has great possibilities in the field of selling and buying, but only very limited possibilities in the field of production. The first answer to this is, as already pointed out, the most important gains from organization for cooperative marketing require that production be an integrated part of the marketing. The term "coöperative marketing" is getting to be a misnomer. This is frequently pointed out today in the case of Denmark. We are told that the system in Denmark should be called "coöperative agriculture," rather than "coöperative marketing." The prospects are that the coöperative marketing associations in the United States will increasingly concern themselves with production.

Predictions are hazardous in such a new field, perhaps, almost as much so as in air-transportation, but do not these examples show the part that coöperation can and will play in "putting American agriculture on a par with other lines of industry"—in the development for the future of this country of a permanent agricultural prosperity?

There are some concrete examples, as, for instance, among some of the fluid milk organizations which show that the coöperative will be able to lead the way in the solution of the problem of stabilization of production. The Connecticut Milk Producers' Association, the Maryland State Dairymen's Association, the Inter-State Milk Producers' Association, and a number of other fluid milk coöperatives have a sales plan by which the farmer is induced through the price structure to so regulate his production method as to quite largely eliminate seasonal surplus, and also to keep his product in line with his share of the market demand. The American Cranberry Exchange bases its sales policy each year on the estimated crop of that year.

Many of the coöperatives dealing in the specialized food products grown in California have surplus disposal

methods which are proving of value as an aid in orderly marketing. Through the introduction of an electric orange squeezer, the California Fruit Farmers' Exchange has been able to market an otherwise unsaleable grade of smaller sized oranges of good flavor.

Much emphasis has been placed upon the part which the coöperative should play in some recent attempts to legislate with respect to the so-called "agricultural surplus." It is the prediction of many careful observers that the coöperatives will in the future play an increasing part in the solution of this important factor in orderly marketing.

It is impossible to evaluate in terms of dollars and cents the advantage to the American farmer of the standardization program of his coöperative organizations. One cannot compare fairly, prices received through coöperative association with those obtained in the open market. The influence of the coöperative on the general market level must always be considered, but one has few if any criteria to go by. Likewise, a coöperative must be judged in this respect as in all others by its accomplishments over a long term basis. Spectacular activity for a year or so, followed by total or partial failure can be said to be of no permanent value. But even failures can be turned to advantage through pointing out what not to do. It is the quiet, unobtrusive, permanent gains that are being made here, there, and everywhere, in the field of coöperative business that are giving the farmers a sense of confidence in their own institutions and agencies.

I think, perhaps, we will not be able to sum up, for some time to come, the permanent, economic advantage of the present standardization program of the American coöperative. Most certainly, the great economic stability of the coöperative is shown by the fact that Danish agriculture has been able to survive the severe stress of the post-war economic depressions.

## APPENDIX

Quotations from the translation of the "Royal Decree" concerning the marketing of butter manufactured in Denmark:

### ROYAL DECREE OF NOVEMBER 17, 1911

According to Section 6 of Law No. 129 of April 12, 1911, concerning the trade in butter and foreign agricultural produce we hereby decree as follows:

#### SECTION 1

To all butter which is manufactured in Denmark in creameries accepted to be controlled according to Section 9 of the said law, from pasteurized (to 80° C. heated) cream—excepting whey cream—or milk and containing no more than 16 per cent of water, shall, with the exception stated in the latter part of Section 6 of the said law, at the place of manufacture be applied reproductions of the mark printed here below, which mark shall be known as the LUR Brand and shall be applied on the outside of the packing as well as on paper labels (control labels) which shall be placed on the butter itself:

The words "Dansk Smør" may be replaced by a translation to a foreign language.

Also Sections 4, 6, 8, 9 and 10 of the Law No. 129 of April 12, 1911, outline the very careful way in which the government of Denmark is now safeguarding the valuable trade mark of the Danish coöperative butter industry.

#### SECTION 4

Danish butter shall not be exported from this country, unless it is made at a creamery which has been accepted for control (see Section 9), from cream or milk which has been pasteurized (heated to at least 80° C.), and at the place of manufacture has been

marked with the marking prescribed in Section 6; provided that the Minister of Agriculture may give authorization for the exportation of Danish butter without the prescribed mark, if it is packed in hermetically sealed receptacles (see Section 6).

SECTION 6.

A common mark applicable to the whole country shall be prescribed by Royal Decree, and it shall be applied at the place of manufacture, to the extent prescribed in the decree, to all butter containing no more than 16 per cent of water made at creameries accepted to be controlled (see Section 9), from cream—excepting whey cream—or milk which has been pasteurized (heated to 80° C.). This mark shall be known as the Lur Brand.

The common mark shall be applied both to the packing and to paper labels (control labels) which shall be placed on the butter itself, and the Minister of Agriculture may issue regulations requiring that letters or numbers or both letters and numbers shall be used in connection with the Lur Brand, and may issue other regulations for the marking.

The Lur Brand shall not be applied on butter which at the place of manufacture (creamery), according to special authorization from the Minister of Agriculture, is packed for export in hermetically sealed receptacles, provided that both each receptacle and the packing containing these are marked by a special marking to be prescribed by the Minister of Agriculture indicating the butter to be Danish. Such butter shall not be sold retail in Denmark.

SECTION 8

It is forbidden, without the permission of the Minister of Agriculture, to manufacture in or to import into this country facsimiles or reproductions of the Lur Brand or of marks which can be mistaken for the Lur Brand or marks containing a Lur in any connection whatever. It is likewise forbidden without the permission of the Minister of Agriculture to manufacture in or to import into this country dies, printing blocks, stamps, etc., necessary for the production of such marks.

SECTION 9

Every person, who manufactures butter from pastuerized cream or milk and who claims the right to use the Lur Brand, must apply to the police in writing.

The police having ascertained that the person possesses the necessary machinery and implements for making such butter, shall at once inform the Inspector of Butter and Margarine for the district of the application received; the applicant shall then be considered as accepted for control and shall be entitled to a receipt from the police for the application.

The Minister of Agriculture will make arrangements, that the applicant may then, on payment, receive packing materials, control labels, paper wrappers, etc., marked with the Lur Brand and, if so required by the regulations, also with letters or numbers or with both letters and numbers.

As long as a creamery has the right to use the Lur Brand it shall pasteurize all cream and milk, from which butter is made and all skimmed milk, which is delivered from the creamery. If the account books of the creamery do not give sufficient information concerning the receipt and use of the above named lur-branded packing material, paper labels, etc., a book shall be kept at the creamery giving this information according to regulations to be given by the Minister of Agriculture.

If the Central Organization of the Dairy Industry shall make a proposal to that effect, the Minister of Agriculture may order the creameries accepted for control to take part in the surprise butter exhibitions at the Laboratory for Agricultural Research, subject to the rules for these, and to take part in the judgings of butter arranged by the dairy associations.

The packing material, etc., bearing the Lur Brand which are supplied to the creameries shall be used only by the owner or tenant of a creamery, by whom they have been ordered, or at the coöperative creamery, to which they have been ordered; and should the owner, the tenant, or the coöperative creamery in question cease to manufacture butter from pasteurized cream and milk, they shall at once notify the police in writing to that effect. In case a

creamery accepted for control is removed, notice in writing shall be given to the police at the place whence, as well as to the police at the place whereto, the creamery is removed. Notices of cessation of removal shall at once be communicated by the police to the inspector of butter and margarine for the district.

By cessation or removal of a creamery and by change of ownership or tenancy, the remaining stock of lur-branded packing material, etc., shall be returned and the payment for same be refunded.

The duty of giving the notices here mentioned shall rest with the owner, or the chairman of committee of the creamery, or the tenant, as the case may be.

The creamery shall, as regards the provisions of this present law, be subject to inspection by the inspectors of butter and margarine according to instructions to be given by the Minister of Agriculture, and to inspection by the police.

Should the Central Organization of the Dairy Industry, to the satisfaction of the Minister of Agriculture, organize a control for the whole country as to the regulations of this present Law dealing with pasteurization, or should local dairy organizations organize such control for their respective districts, then the Minister of Agriculture may—for the whole country or for the districts in question—withdraw the control by the police totally or partly.

SECTION 10

If a creamery accepted for control acts contrary to the provisions of this present Law or contrary to regulations to be given under this Law, the Minister of Agriculture shall have power to deprive the creamery of the right to use the Lur Brand, and to cause the remaining stock of lur-branded materials issued to the creamery to be returned through the police. The Minister of Agriculture shall have power to deprive for a time such creameries of the right to use the Lur Brand, the butter from which is deemed unsuitable for export, according to regulations to be issued according to proposal made by the Central Organization of the Dairy Industry.

# What a Federal Farm Board Can Do

## A Basis for a National Agricultural Policy

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PROPOSALS for American farm relief fall into four separate classes:

1. Money and credit.
2. A price on exports above the world market.
3. Tariff.
4. A strong marketing policy administered through a Federal Farm Board with ample powers and adequate money.

Let us examine the fundamentals of each of these in turn.

### Money and Credit

For many a decade our farmers felt the heavy hand of a high interest rate on a remorseless mortgage. These mortgages were usually of the term variety, the full amount due at a given date. Such terms were not suited to the slow annual returns of the farm. No big fees nor exceptional sales came along as windfalls and growing families sopped up the annual increments.

Interest rates in pre-war years on farm mortgages were high for three quite sufficient reasons. In the first place, we were a debtor country, and our prevailing interest rates had to be high enough to attract capital from abroad and keep it here. In the second place, the heavy drain on farm incomes of a high interest rate on an inflexible mortgage tended themselves to make such mortgages risks even to the investors. And in the third place the banker was more interested in the short-term loans to business and to manufacturers; and investors felt their money to be safer in the securities of railroads, public utilities, and industrials. And that not without reason. For the very security of such investments depended on far-flung lines of transportation on the one hand and the development of industries on the other. As transportation systems extended into virgin territories, the land values back home migrated to the newer regions with the pioneer farmers. The leftover and leftbehind labor from abandoned farms became the backbone of the factory town. The factories prospered from such labor and they stayed at home with the investor. Such sectional shifts at once caused the banker and the investor alike to look askance at the farm loan and to have faith in the industrial loan and in the loans to the public utilities that grew apace with industrial development.

Part of the irony of the situation is that during the nineteenth century the farmers' toil paid for the foreign loans, interest and principal, and these foreign loans largely made possible the cities that in turn attracted the capital that made the farmers' interest burden higher. Import of capital goods and the interest thereon can be paid for only by the export of goods—real hard-fisted goods—not promises to pay. For our first century the goods for this export could come only from our farms. We had no other substantial source. So we exported the ingredients of a virgin soil through crops grown by the hard work of farmers and so got the means in no small part to build the rail-

roads that tapped new soil resources to compete with the established farms and to build factories and utilities to compete with farmers for capital.

In such wise did we build homes for a hundred million people in 100 years—the great romance of all history. But at the cost of a declining farm income though with the advantages of rising urban income. And even then folks had the temerity to talk about "Back to the Farm."

But with the World War the facts shift, and with the shift in facts comes shift in credit legislation. We move from a debtor country paying a half billion dollars yearly in interest to foreign countries to a creditor country with a half billion of interest coming to us every year. Those who are working to rehabilitate Europe and to develop new countries in the newer continents now pay tribute to us every year: the new creditor country. Money comes in and gets plentiful. Interest rates fall. It pays to begin to look up the old farmer at last to see whether money cannot be loaned more profitably to him. "Yes the interest rate is lower." "Oh, the inflexible terms are hard on you." "We will get Congress to help." So we have the Farm Loan Bank and the Special Short Term credits and easy payment plans, supported by Federal security and aid. What would have been particularly helpful a generation ago because farmers needed it now comes easy because investors also want it. But the substance had been changed anyhow: interest rates are lower to everybody, farmers included—and they promise to stay lower. So while credit legislation helps, and wise credit legislation should be encouraged, it no longer can be held to be a solution for our agricultural problems.

Not that our mortgage problems are at an end. Mortgages in the war years represented on the whole about one-fourth of our agricultural land values. But land values have so declined since that about the same mortgage total represents one-half present land values. In those sections where values continue to decline our farms mortgage risks will grow. But granted the security of a stabilized agriculture, interest rates will be as low as those for comparable investments.

Another form of money and credit legislation of which farm interests should now be particularly watchful is that centering in the legislation creating our Federal Reserve System. That system has proved of great service to us in mobilizing credit and in nationalizing banking and credit policies. On the whole it is the most useful national legislation in this generation.

But other changing facts have inevitably (and properly) centered in this Board powers of great import to all business and to agriculture in particular. In the gold basis days of prewar years, the inflow and outflow of gold reflected the supply and demand for money in a rather logical way. But in these latter years the world of necessity has gone from a gold bullion basis to a gold exchange basis. That fundamental change gives new power to the rediscount policies and the marketing policies of the Federal Reserve Board. These policies can—and do—make money cheap or dear sectionally, nationally, or internationally. The use of this power farmers must watch with the same care that bankers and industrialists watch it to see that it serves the purposes—not of speculators—but of stabilized business. In this new sense the money problem will ever remain an important one.

### HIGHER EXPORT PRICES

A second group of proposals for farm relief center around bolstering up the

prices of our exported surplus. No one seriously proposes arbitrary prices, regardless of prevailing prices in the world market, but they do propose in one form or another to make the export price of our farm surplus higher more or less than the world price.

One such plan is the Export Debenture Plan. Exporters of farm surplus are to get certificates in certain amounts worth their face value in paying import duties. Such certificates would, of course, at once have a market value practically equal to 100 per cent of their face value. The amount per bushel of wheat or per pound of cotton or of pork or of pork products or whatever the surplus may be will be ascertained in different ways, but anyhow the amount has to be sufficient to have some economic effect on the producer, otherwise it is of no avail. In this plan the money going to the farmer would come out of the Federal Treasury through lower custom receipts to the amount of custom duties paid for by these certificates rather than in money.

Other plans would take the money directly from the Federal Treasury and allow some board to decide how much export subsidy should be thus paid. A third group would have this money come from the farmers through a so-called equalization fee. One of the ironies of politics is that many of those who objected to an equalization fee because it wronged non-participating farmers were soon saying—to win an election—that this subsidy should come from the taxpayers! In the long run, to be adequate and to be just, it must come from the farmers. But of this more at another place.

Regardless of where the subsidy comes from in the first instance, let us examine the assumptions underlying this plan. Are there not these two assumptions:

1. Our domestic market will continue to use all or nearly all of these products, so that the surplus will not be large.
2. The world price will be sufficiently high so that this price plus the subsidy will mean a fair price to the American farmer.

Can we tie a permanent American agricultural policy to either of these assumptions?

Let us examine the first: the future of our domestic market. Many are the folks who argue thusly: It is only a decade or so until our domestic market will consume all our farm products. Then we can slam tariffs on agricultural products and keep farm prices up to an American living standard. So?

In the first place, we have tinkered with our birth rate. By restricting immigration and by emphasis on American living standards our birth rate is not keeping up to old levels, nor are consuming mouths being increased by large numbers of adult arrivals.

I complain not of this. Much is to be said for a higher living standard: better health and better training of small families. But eating farm food is not one of them. We now have in this country about the same number of children in the first grade in our schools as we had six years ago. I do not conclude from this that our population is not going to grow. The span of life is longer. But the rate of population increases of past decades will not continue. Of that we can be certain. Recent statistics tend to show at least no increase in birth rates in Europe. So the population grows more nearly static there also.

But the slowing up of birth rates is not the big fact. The big fact is that quantitatively per capita consumption is declining. While it declines it shifts. It shifts in ways advantageous to some farmers, notably dairymen. But the

big beef eater has passed, and the gourmand. City life will not stand its pace on an overloaded stomach. Dieticians teach children not to overeat (unduly). We are all eating less (to our good), and we are eating lighter foods. We are eating more fruits, milk, vegetables, and less of the staples. But that does not help farm markets, on the whole, though it may for the time help dairy farmers or fruit, sugar, or vegetable growers. A declining per cent of the total family budget goes for food, leaving more of the income for other purchases. And so the manufacturer does not feel the decline in rural purchasing power as he otherwise would.

It seems, therefore, that our total domestic market for farm products will slowly and conservatively expand—but at a declining rate. And this declining rate comes just as scientific farming gives a terrific punch to increased production. The efficiency of agricultural workers has increased about 3 per cent per year since the World War.

Any one of two dozen factors now in use will *alone* take care of this increasing market. Here are just a few of them:

Better selection of dairy cows is giving an increased output with fewer cows.

Better feeding is getting better output from the same cows.

Motorizing farm work has already released by fewer horses some 10,000,000 acres of hay; 8,000,000 acres of corn, and 6,000,000 acres of oats for other purposes.

Improved farm implements are increasing notably the output per worker. Better and cheaper fertilizers multiply production from the same acreage.

Land is being put more nearly on a full-time basis than ever before.

Manufacturing processes are utilizing foods for both humans and animals, heretofore largely wasted.

Recent improvements in growing and picking cotton are releasing large acreages in southern states for dairying and other purposes.

From 1920 to 1924 our farm population declined 10 per cent and our agricultural production increased 5 per cent. Our production right now is increasing more rapidly than our population. And so we might go on. Are we soon to have a deficit on our domestic market? Is it not just as probably that we could for a substantial period feed the industrial world? Who can foresee the end to profitable output under scientific farming? Who can face the facts and place any reliance on a deficit domestic market as the sole solution of our farm problem? Especially since the trend recently in our exports is *upward!*

There are some factors that should be weighed on the side of better domestic markets. One of these is a growing industrial use of present farm output. I refer to the use of cornstalks for paper and rayon, and of grain alchohol for gasoline, etc. But here again other substitutes offer so as not to permit too rosy a view of this type of market so far as substantial increase to net farm incomes is concerned.

There is another easy assumption, and that is that the world market price plus any reasonable subsidy will assure the American farmer an American standard of living.

But there are changes going on elsewhere as well as here. All the changes making for increased output at lower cost going on here are being adopted elsewhere also in varying degrees. Thus Europe notably is learning to double her dairy output from the same pasture acreage by better pasture cultivation and the use of fertilizers. At an increased cost? Yes. But not at a cost so much increased above returns. No, she will never double her milk out-

put probably. But she will have greener fields and fewer acres in those crops, such as the cereals, that mean barren cultivated surfaces and hence greater soil losses.

Our virgin prairie and forest soils when put to agricultural production fed not only our cities but largely European cities as well, and we forced English and most continental agriculture well nigh into bankruptcy. Such resources are gone with us, but in other climes north and south, new acreages open up. Argentine and New Zealand are about where we were in the eighties. The long sunlight of northern hemispheres, notably Canada just now, is ripening wheat and oats as the shorter hours to their southward never can.

No, we cannot assume that the world price plus a little more will solve our agricultural problem. It will help to the extent that it helps. But at its best—or worst—that cannot be much nor life lasting. To spend $300,000,000 per year will mean $50 per family per year. Great credit is due those who champion such plans. They at least show that they can face facts as they see them and that they are ready to do something more than talk. Our agricultural situation cuts athwart our national life too deeply to waste time with the "much-talkie-little-doie" crowd. And such subsidies will prove useful in tiding over essential production changes. But subsidies shorn of production or marketing guidance can be harmful.

### THE TARIFF AS A CURE-ALL

Another assumption is that the farmers' ills will all be cured by the tariff. The tariff costs the American farm family from $30 to $50 per year. Can the farmer ever get back what it costs him? "Yes," say the tariff advocates, "because he will have such a fine domestic market." But a city domestic market means a declining per capita consumption as we have seen. "True, but a tariff will mean more people in the cities." How? "By immigration." But we are restricting immigration—"then by giving a better wage in the cities for the sons and daughters of the farm." That is no doubt correct. Does that help the farmer? If so, how much is it worth? "But the continuance of a tariff policy will build up a domestic market in excess of domestic production and hence will in time make possible a protection that protects the farmer." But has it? Does it? Will it?

The answer must lie in a careful analysis of the production and consumption of our main farm products. Such an analysis shows:

1. No hope for general cotton protection within any reasonable period.
2. No hope for wheat protection save for minor grades within any reasonable period and that limited protection we now have.
3. No hope for hog protection within any reasonable period. Hog production in Europe is already up to pre-war standards, and promises to stay there on cheap Argentine corn alone.
4. No hope for corn protection so long as we export corn through pork and sell pork products at world prices, though we can and do keep out some direct shipments of Argentine corn.
5. No hope for the potato grower. For though we import few potatoes our production is so ample for domestic consumption and production so multiplies with "400-bushel" producers, that there is no hope in sight, anyhow.
6. No reasonable protection is in sight for the tobacco grower. We export a substantial part of our production.

7. There is at present real protection to the dairy farmer with production increasing so fast that the day cannot be far distant when our production will fully equal our consumption and we must squarely face whether we will limit production or meet export prices, or do something of both.
8. There is present protection for beef cattle with a declining per capita consumption and increasing production costs.

Such is the situation under present facts without regard to the shifts in output and consumption indicated above due to scientific production, which is increasing production (and exports) as land values go down.

Those who can find in the tariff in the face of such facts any basis for a permanent solution of our agricultural problem are only finding what they are bent on looking for. The facts are all the other way.

On some farm products the tariff is now and will continue to be helpful. As such the farmers are entitled to all that help they can get—doubly entitled to it because the votes of their representatives have gotten true protection for others while telling the farmer that he too was reaping its benefits.

Much is to be said for our high price market kept so by tariff walls and restricted immigration. But the farmer buys in the main in this, the highest price market in the world, and sells in the lowest. Of all the good things to be said for the tariff, therefore (and they are many) farm relief is not one of them.

## WHAT A FEDERAL MARKETING BOARD CAN DO

What a Federal Marketing Board can do depends in the first place on the stamina and will to do of that Board. A weak vacillating Marketing Board dominated by visions narrower than the task and by those lukewarm or adverse to the farmers' interests can do nothing. Worse, it can be positively harmful.

But granted the will for a real board with vision, power and money, it can do much of lasting benefit and of fundamental importance. Here are just a few of the things it can do.

First, it can stand on the shoulders of the constructive fact finding and policy making work of the Federal Department of Agriculture. That work in the main is well and capably done. It has been hamstrung at times in its history by the domination of those who wanted cheap farm products at any cost. It has suffered from vacillating policies. It has had growing pains. Young employees of vision and training have been replaced by office holders, entirely too often for the good of our country. Its policies have been made subservient to the dominant policies of given administrations. Politicians have played with it even to swapping patronage for appropriations. Such defects and limitations must be admitted by its best friends.

But yet it has grown in power in vision and in usefulness. Despite these handicaps it has grown. Because of the growing need of the great interest it represents.

How can a Marketing Board improve on what the Department has done and is doing? By greater and truer vision; by a determination to win, just because it represents more completely than any one man ever can all the interests of agriculture; by having more money to spend than it is well for any one man to spend; by justifying its existence through service; by assuring continuity of marketing policies in a way that changing cabinets can not.

To do this it must be truly representative of agriculture backed by a

national opinion that this bedrock industry must and should thrive—reasonably thrive at least. And how can we best move toward that end? By astute, persistent, practical marketing. By making the most out of every one of our national assets, be they agricultural, industrial, banking, or transportation.

## SOME ESSENTIALS IN A MARKETING POLICY

In the market lies the answer to farm prosperity as to any prosperity. This Board must help market. The market includes production, selling, and consumption. Our marketing can be vastly improved by strong policies in the hands of those with market sense. And how?

Consumption can effectively be drafted into channels more in keeping without national interests both at home and abroad.

And let us start abroad first. Our foreign policies should certainly be shaped only after their full effects on any agricultural situation are weighed. We should have policies looking toward our agricultural sales as well as our industrial sales, neither to the exclusion of the other. In guiding our growing foreign investments our future agricultural markets should have their just share of consideration. And this will be of increasing effect.

International transportation systems should become an integral part of our agricultural policy. The St. Lawrence Waterway will do more than save our Plains farmers two or three cents a bushel on wheat. It will bring the Atlantic Ocean to the Mississippi Valley. Products will come in as well as go out. And that Great Valley will the sooner come into its own industrially. The Mississippi Barge Canal should make of every port on that river a port on the Gulf. Our merchant marine policies are of outstanding importance in a permanent agricultural policy. Such a board will ever keep its weather eye on cheap and ever cheaper transportation to and from our markets.

Such a board should take a look at our domestic railway rate structure. Here are literally a thousand questions vital to a national as distinct from a sectional farm policy. Some rates give too little heed to long haul costs, some too much. Congress has directed that consideration be given to this. And the Interstate Commerce Commission has proceeded with about as much vigilance as one could expect when no advocate is at hand.

Such a board should immediately set out for a survey of those marginal lands now nominally in agriculture that should revert to our national or state forest or grazing domain. Vast acreages should be abandoned in excess of the vast areas already abandoned. Sums of money should be available first for this survey, and second for the transportation of poverty-stricken farmers in these areas to other areas where employment suited to their capacities can reasonably await them. I do not suggest compensation. I suggest only that we be human enough to help these bankrupts get a new start. Nor do I suggest this because it will lower production. One good farmer on one small farm can produce as much surplus as 1,000 of these destitutes are producing. I suggest this first as a humane thing and second as an essential step toward water and soil conservation, and a permanent national policy toward our forest and land resources.

Such a board must work with and through forces that will adapt our output to our best markets with full reference to returns, to consumption demands, and to the longtime needs of a national agricultural policy. For

instance, I venture to say that adequate surveys would reduce wheat and oats acreage in most of our states. We can profitably grow wheat in competition with the world market on large specialized wheat farms with machinery that will take two hours of man labor where twenty are taken on the average small farm today. We can afford to grow wheat as a nurse crop in certain sections. Such adjustments would put wheat on a profit basis in most places where it would still be grown even though we still have a substantial exportable surplus.

The boll weevil is moving our cotton acreage westward into drier and northward into cooler regions. In these newer regions epoch making changes are being made through machinery for picking and handling cotton. This means a new revolution in agriculture in our Old South. It no doubt means also that we continue to be a major factor in the world's cotton market. The Old South is importing dairy cows. Think of the help such a Federal Market Board can give in this adaptation. Established dairy sections can alone appreciate the changes necessary to get good dairy help in the old Southland. It's one thing to buy a good Jersey cow; it's quite another thing to keep her and her offspring productive of net income over a period of years.

## MAKING THE MOST OF OUR NATIONAL ADVANTAGES

In shaping such a marketing policy the board should make the most of our national advantages. One of these is large scale farming. We shall have both gardens and large estates. The proportion need not be set up now. Let us make the most of each. Let us have specialized farms where profitable.

We have the lead in the world on scientific farming. The megaphone such a board will have can alone keep us a lap ahead of any other country for some time to come at least. We must not stop our progress. We must make more of it.

We have large scale buying and selling. All the advantages in that we should keep. Large scale business is part of our national flare. Let us profit by it. This includes our great grain and cattle markets.

We have large scale distributing facilities in milk, in milk products, in milling, and other companies. Let us make the most of their every advantage, and their advantages are numerous. How silly it would be to break these up when other countries are now securing them at such heavy financial and social cost.

We have our huge banking and investment houses. Let us tie them right into our agricultural marketing policies. Myriad are the ways this still can be done.

Let us have a new survey of all our special advantages as compared with other nations. And let us under capable and farsighted guidance make the most of every one of them in this marketing policy. And in these advantages let us never forget that the first and foremost is a hard working dependable worthy people trained for progress, under an educational system that will mean mobility in labor responsive to mobility in capital.

## COÖPERATIVES

The beginning of wise marketing is the product. The product must be suited to the demand, and the demand suited to the product. Consumption standards change and under modern facilities for fact dissemination will change ever more rapidly.

Producers must adapt their product to the market with every changing consumption standard, even fancy or

whim. This they must do on a regional scale, and on a national scale. Nay, the nation alone will not do any more. On an international scale, if we are to take our place in the world's sun. And that we must do, if for no other reason than that pointed out above: we have to, or limit production.

Now, how can standard of product on a large scale quickly adaptable to production on the one hand and consumption on the other be secured? Every way has been tried once. High prices have been tried spasmodically with havoc. National subsidies have been tried with havoc. "Whoopee" campaigns for this and that have strutted their stuff and expired. One way only has gotten farm results and that way lies through agricultural coöperatives.

The coöperative must have power to enforce its standards; that a national law and a national Farm Board can give it. The coöperative must be organized on a scale as big as its business. That can be assured most completely and economically through national legislation and through the guidance of a national Marketing Board. Money here will help if spent with an eye to returns, and to make coöperatives self-supporting and self-directing.

A national law should make possible financial aid to self-supporting coöperatives with their own fees during their early years of establishment. More than this will be detrimental to farmers themselves. In this period of adjustment export subsidies may be tried out on a limited basis, but only until a marketing plan is full grown. Nothing will destroy coöperative marketing so soon as overstimulated production. These things under Senator McNary's Bill now before Congress all are possible.

These are the necessary outward forms of an inward life. The forms all can be lifeless.

**The life of the coöperative is the will to market advantageously.**

That means first adapting production to markets.

That means standards.

That means adaptable standards.

That means good will of both producers and consumers.

That means marketing sense, and marketing sense is rarer than horse sense even in this day of vanishing horses.

Marketing sense comes from marketing on a scale big enough to get the feel of every marketing factor.

And so our Federal Marketing Board holds promise for success just in so far as it is built on self-directed, self-contained coöperatives.

Produce? They can produce their heads off if that means greater net returns. But every producer will know his why and wherefore to an extent he never can know them without. The farmer will be in on and know about all the facts in his fate. That may mean more farm abandonment. It may mean more grassland. It may mean—and probably will—fewer cereals grown. Anyhow, it means knowledge.

And knowledge is power—the only power in the last analysis marketing sense can be built on.

And marketing sense is the beginning and end of a permanent agricultural policy for our country.

# The Pending Federal Farm Board Bill

By Hon. Charles L. McNary
Chairman, Senate Committee on Agriculture and Forestry

THE bill I have introduced includes the principal features of the McNary-Haugen bill without the equalization fee. But the new measure is more than the old bill with the controversial fee section stricken out. It includes not only those basic provisions of farm relief that have won the support of farm leaders in general, but also the recommendation of Secretary Jardine and other administration leaders, together with the surplus control legislation promised in the Republican platform.

The new measure is designed to handle surplus farm products and to promote orderly and efficient marketing. It is also designed to encourage coöperative marketing and to enable the producers to get greater control over the marketing of their products, thereby affording farmers a much-needed bargaining power, just as unity of action through organization has given bargaining power to industry and labor.

The bill provides a revolving loan fund of $300,000,000 for the necessary financing, that is for making loans to stabilization corporations for handling the surplus. Loans for certain other purposes would also be made to coöperative marketing associations. It is not proposed to dispose of crop surpluses at a loss to be paid out of the United States Treasury.

Stabilization corporations are the heart of the stabilization and surplus control plan itself. Through these corporations, owned and controlled by coöperative associations and other organizations of producers, the seasonal or year's total surpluses will be handled for the benefit of all producers, without putting on the members of the coöperatives more than their fair share of the cost and responsibility in handling surplus crops. This plan goes beyond the old idea of merely loaning money to coöperative marketing associations. The corporations are authorized to handle as much of the surplus as may be necessary for orderly marketing, whether the products handled are produced by members of the coöperatives or by others.

The plan as a whole would be administered by a Federal farm board consisting of the Secretary of Agriculture and six members who would be in sympathy with agriculture and selected for their demonstrated capacity and fitness for the job.

Numerous ways are provided for encouraging the coöperative movement. Aside from loans to stabilization corporations, the farm board is authorized to make loans to the individual coöperative associations to enable them to make larger advances to the member at the time of delivery of the product to the associations, beyond the advances possible under existing credit agencies. Safeguards are provided for the protection of the funds advanced.

The farm board is also authorized to help provide price insurance, under certain conditions designed to protect such funds as may be advanced to start the insurance plan. The board is given ample authority to work out a sound basis for the insurance, and is expected to proceed with caution since price insurance is comparatively new. The insurance should enable a coöperative association to make greater ad-

vances to the members on their delivery of the commodity to the association.

While this plan goes beyond any legislation yet enacted for the aid of farmers, its ultimate success is in part dependent on existing laws providing for agricultural credit, coöperative marketing, research in agriculture, adequate tariffs, and other agricultural legislation.

# Agriculture Surplus Control

By Hon. W. M. Jardine
Secretary of Agriculture

BEING a letter from the Secretary of Agriculture of the United States to the Chairman of the Committee on Agriculture and Forestry, United States Senate, submitting a report on S. 4602. A bill to establish a Federal farm board to aid in the orderly marketing, and in the control and disposition of the surplus, of agricultural commodities in interstate and foreign commerce.

December 19, 1928.

My Dear Senator: I have your letter of December 8 inclosing, for my consideration and report, the bill which you recently introduced in the Senate, S. 4602, "A bill to establish a Federal farm board to aid in the orderly marketing, and in the control and disposition of the surplus, of agricultural commodities in interstate and foreign commerce."

The main objectives of this measure, in my opinion, are: (1) To provide means of handling recurring surpluses in order to stabilize prices of farm products, and thereby to secure, by orderly marketing, the maximum returns for the crop as a whole; (2) to enable the producer to get a greater share of the consumer's dollar by reducing the cost of marketing and by preventing speculation and waste in handling farm products; and (3) to encourage producers to organize effective associations under their control for a better balanced production, more economical distribution, and greater bargaining power in the market. I am firmly convinced that these objectives are essential to a sound program for permanent improvement in agriculture and that they are attainable with the aid of the plan proposed in this bill.

Without attempting to discuss this measure in detail, I shall review its main provisions in order to describe briefly what I believe to be the principal functions of the major parts of the plan.

A Federal farm board is provided for in Section 2 and its general powers are described in Section 3. It is essential, as contemplated in this bill, that the members of the board should be men of demonstrated capacity and fitness, as on them rests the responsibility for successful administration of this plan. Given a board composed of men of outstanding ability and sympathetic understanding of the problems and needs of agriculture, I am confident that the plan would succeed; without such a board, it would fail.

The advisory councils, provided for in Section 4, would afford producers of the various commodities continuous and effective representation before the board and before the public.

The stabilization corporations (Sec. 5) are central agencies with two main functions: (1) To act as merchandising agents for the coöperative marketing associations and for individual producers owning stock or membership interest in the corporation, and (2) to handle recurring surpluses of farm products. These corporations would be under the control of producers and would not put the Government directly into business.

Under the first function, each corporation could become a strong, central agency for merchandising farm products and should be able not only to

stabilize the market and to secure bargaining power for the producer, but also to merchandise the commodity efficiently and to secure returns for the farmer according to the quality of his product. The corporation should become a powerful factor in the market, operating in the interest of the producer.

Under the second function, namely, that of handling surpluses, the corporation would be able to buy surplus farm products produced by nonmembers as well as by members of the coöperative associations, thus relieving these associations of carrying alone the burden of surplus control. This is a great deal more than a plan to lend money to the coöperative associations. The stabilization corporation, through its ability to handle as much of the product as might be necessary to stabilize the market, should be able to save the producer from preventable loss due to exceptional crop surpluses.

With the operation of stabilization corporations, it is obvious that speculators would not dare undertake, by heavy speculative short selling, to depress prices below a level justifiable by supply and demand. That such speculation occurs is forcefully illustrated in Technical Bulletin 79 of this department, "Major Transactions in the 1926 December Wheat Future," showing, among other things, that on September 8, 1926, two professional speculators controlled a short interest of more than 22,000,000 bushels, which was 32.6 per cent of the total open market contract in the December futures. Such short selling is sure to depress the price at the very time when farmers market heavily. I am confident that the stabilization corporation would go a long way toward eliminating this abuse.

Section 6 provides for (1) loans to the stabilization corporations for handling recurring surpluses, including the purchase or construction of necessary physical facilities, and (2) loans to individual corporative associations for advances to members at the time of delivery to the associations in addition to the credit obtained from existing sources, for construction or purchase of physical facilities, for experimental price insurance, and for extending the membership. Certain conditions are laid down to insure reasonable safety of the funds advanced, and the board is given ample authority to prescribe such additional safeguards as may be necessary to protect the public funds and to insure their use only for purposes that will promote the objects of this measure.

Section 8 authorizes the appropriation of $300,000,000 for a revolving loan fund. It is assumed that Congress will provide for raising this sum, or as much of it as may be needed, since there is no surplus in the Treasury. This is not a measure to subsidize agriculture by calling upon the Treasury to pay losses incurred in disposing of surplus farm commodities. It is a plan to finance, by loans, a broad program for the aid of agriculture. With a strong farm board to administer these loans, I believe that the principal need not be impaired, and the loans would bear a rate of interest at least sufficient to cover the interest paid by the Treasury on its issues. After these many years of study and discussion, it is, or should be, generally evident that the agricultural problems which this measure is designed to solve are charged with a vital public interest justifying governmental assistance including public loans.

It might seem, upon hasty consideration of this measure, that the terms of the loans give preference to the stabilization corporations as compared with individual coöperative associations.

With more careful study, however, it becomes evident that these associations are granted advantages, through the corporations, which should be decidedly helpful to the coöperative movement. As already pointed out, these corporations would be well qualified to act as central merchandising agencies for the member organizations, and would stand ready to meet emergencies due to recurring surpluses, without placing the burden of surplus control exclusively upon the coöperative associations. Liberal but carefully controlled financing of the stabilization corporations is necessary, especially in the formative stages of their development and until it shall have become possible to finance their operations through regularly constituted credit agencies. Moreover, the stabilization corporations would be owned by the coöperative associations, and by individual producers who might acquire shares of stock. There is, therefore, no fundamental difference between the assistance granted to the individual coöperative associations and that granted to the stabilization corporations.

Many forms of direct assistance would be granted to coöperative marketing under this bill. Provision is made in Section 9 for clearing-house associations for more advantageous distribution of perishable agricultural commodities. The direct loans to coöperative associations are designed to strengthen the coöperative movement. In fact, one of the principal objectives of the whole measure is to encourage producers to organize for more effective control of their business, and it is evident that a properly constituted board would make every effort to carry out the declared policy. This measure, if enacted into law, in my opinion, would afford a powerful aid to coöperation in agriculture, could be put into operation quickly after the organization of the board and of advisory councils, and would not require many additional Government employees.

While this measure goes far beyond any agricultural legislation yet enacted, it is based in a large measure upon existing legislation, especially that providing for agricultural credit and research. I believe that the proposed farm board and the whole system of advisory councils, stabilization corporations, and underlying structure of coöperative associations would enhance greatly the effectiveness of the results of economic and technological research in agriculture. The actions of the board, the business policies of the stabilization corporations and of the coöperative associations, and the development of suitable programs of planting and breeding must be based on adequate information, as suggested in Section 3, paragraphs (g) and (h). It would be necessary, therefore, to strengthen our research especially on factors affecting crop prices, competition, and demand in foreign countries, and new uses of farm products.

Should this bill become law, it probably would be necessary to amend it from time to time, as contemplated in Section 3, paragraph (c), which directs the board to make an annual report to Congress on "any matter relating to the better effectuation of the declared policy, including recommendations for legislation." The necessity of making changes in the light of experience certainly would apply to any surplus-control legislation.

This measure, having been introduced and copies distributed, no doubt is being studied in detail by agricultural leaders and others, and it is highly probable that meritorious suggestions will be made for its improvement. I do not believe, however, that it should be necessary to change its funda-

mental structure, as it includes those basic provisions on which there appears to be an increasingly general agreement.

No single measure could be expected to include all that should be done by legislation to strengthen the economic position of agriculture, but I am firmly of the opinion that this bill provides the basis for a substantial and permanent improvement of this our basic industry. I do not believe that the relation of other needed legislation to this measure is such as to necessitate its delay pending the enactment or prolonged consideration of such legislation. Since it would require some time to put the provisions of this bill into operation, I believe that it should be passed as early as possible in order to make it applicable to the 1929 crop.

Sincerely yours,

W. M. JARDINE.

HON. CHARLES L. MCNARY,
*Chairman Committee on Agriculture and Forestry, United States Senate, Washington, D. C.*

# Book Department

HUGHES, CHARLES EVANS. *Our Relations with the Nations of the Western Hemisphere. The Stafford Little Lectures for 1928.* Pp. 124. Price, $1.75. Princeton University Press, 1928.

The Princeton University Press has performed an important public service in making these admirable lectures available to a large circle of leaders. In these three lectures, Judge Hughes has set forth with lucidity and conciseness the essential principles of American foreign policy. His treatment of the subject will serve to clarify much of the confused public thinking that now exists relative to the Monroe Doctrine and to the other principles of the foreign policy of the United States.

One of the most striking features of this book is the clearness with which the author sets forth that the foreign policy of the United States embraces many principles other than the Monroe Doctrine and that it is no service to the country to place the cloak of the Monroe Doctrine over principles that have no organic relations with it. Furthermore, he gives a distinct and definite interpretation of the Monroe Doctrine and expresses himself in favor of the establishment of similar doctrines in all the republics of Latin America; thus making the Monroe Doctrine continental in scope.

In his treatment of the Caribbean policy, Mr. Hughes is no less illuminating and suggestive. He shows how the Panama Canal in its relation to our nation's defense has given us a special interest in this region. He also emphasizes the necessity of placing definite limits on the scope and extent of this interest in order to avoid making it the excuse for interference in the internal affairs of the Caribbean republics.

This little book of Mr. Hughes is indispensable to every student of our relations with the countries of the Western Hemisphere and should also be read by every thoughtful citizen interested in the cultivation of closer relations between the United States and Latin America. It is in every respect the most illuminating work that has appeared on the position of the United States in the Western Hemisphere.

L. S. ROWE.

SERING, DR. MAX. *Deutschland unter dem Dawes-Plan.* 10 Marks. Berlin, 1928.

This volume, written by Germany's distinguished agricultural economist, is soon to appear in English with the title "Germany under the Dawes Plan." (Published by P. S. King and Son, Ltd., London.)

The world is again discussing reparations, more vigorously than at any other time since 1924, the year when the Dawes Plan was put into operation. A new committee is now considering the plan after four years of actual operation. This "Second Dawes Committee" has been appointed in view of the agreement reached at Geneva September 16, 1928, by Great Britain, France, Germany, Italy, Belgium and Japan, that a definite settlement of the reparations question was necessary. The book is, therefore, timely.

The first three chapters, constituting Part I, serve as a historical introduction. They present little that is new, but give the background from which the Dawes Plan began to work. They show the injustice of the Versailles Treaty, the unfair reparation charges made by France, Belgium and Great Britain between 1919 and 1924, the economic effects of the invasion of the Ruhr, and the work done by the Dawes Commission. In this introduction Professor Sering marshals facts and figures which few will dispute. They have been shown to be true by unprejudiced observers who have also noted the obvious injustice to Germany. Professor S. B. Fay's two volumes just published on "The Origins of the World War" (Macmillan, 1928) conclude that "One must abandon the dictum of the Versailles Treaty that Germany and her allies were solely responsible" for the war.

Professor Sering's real contribution is in Part II—two chapters and an appendix which together constitute the most authoritative statement on economic conditions

in Germany (1918–28) since Bergmaun's *History of Reparations* (Houghton, Mifflin and Company) appeared in 1926. In these chapters the writer shows that reparation payments for the years 1924–1928 were made out of borrowed money. He points out (page 85) that the opposite of the effect desired by the Dawes Plan has come about, as Gustav Cassel showed. The plan was arranged to induce a flow of capital from Germany into other countries—the stream, however, has flowed in the opposite direction. A chapter (of 108 pages) presents statistical proof that Germany's balance of trade has been unfavorable from 1924–27, while reparations can be paid only out of an excess of exports over imports. This chapter discusses in detail the following industries: metal, chemical, textile, leather, agriculture and livestock. These industries have all suffered from the war and hence Germany is impoverished because of losses in resources and markets, because of political realignment in Europe, and because of higher tariff walls. Capital is lacking everywhere in the country. Taxation is exorbitant and agriculture at a low ebb.

A concluding chapter on "The Outlook" is plainly pessimistic. Foreign loans have been thus far expended in paying reparations. Credit extension must soon stop, and Germany will again be paralyzed as in 1924. Interest rates will rise, factories will close, unemployment will increase. Imports will decrease and exports increase, but even then they cannot be made to balance.

This chapter on the outlook for the future will not be regarded as favorably as the rest of the book. An "outlook" never can be. In the first place, it is theoretical rather than practical, and Mr. George P. Auld, former Accountant General of the Reparation Commission, would surely disagree with its conclusions. The last report (1928) of Mr. S. Parker Gilbert has drawn conclusions antithetical to those of Dr. Sering. In the next place, it makes out the worst possible case for Germany. Dr. Sering says his task as an economist was "to dispel the mists which beclouded the real economic conditions in Germany." But he adds, "He who serves truth must formulate the demands of justice." Both of these tasks he has done well. Reparation demands are unjust in principle and in amount. But his proof that Germany cannot pay the "standard year" charges is not convincing. This proof is after all a work of supererogation. *Man muss nicht das Kind mit dem Bade ausschütten.*

HARRY T. COLLINGS.

BEVERIDGE, ALBERT J. *Abraham Lincoln, 1809–1858.* Two volumes; pp. xxviii, 607; x, 741. Price, $12.50. Boston and New York: Houghton Mifflin Company, 1928.

One approaches these two volumes with a tremendous amount of respect. Senator Beveridge, celebrated as a scholar for his *Life of John Marshall*, spent many years in the preparation of the material here presented. He intended, as stated in the preface to the first volume, that this biography should be a "companion piece to the Marshall, continuing the institutional interpretation of America and weaving it about the life and career of Lincoln as he had tried to weave the first part of such an interpretation about the life and career of Marshall. In the two works he would have covered the subject from Colonial days to the end of the War of Secession." It is a great pity that the work could not be completed as planned; it extends to November, 1858; Mr. Beveridge carried it that far before his death.

The author's scholarly methods are unquestioned. He never accepts a bit of information as fact until he has done everything within his power to verify it. He visited every locality in which Lincoln lived or worked; he sifted tradition down to its basis of fact or else rejected it; he observed for himself the surroundings and, with his immense knowledge of the details of American life and behavior, drew his own conclusions as to the effect of environment upon the young man. This biography, however, is not of the so-called psychological type that assumes the thoughts and dreams of the subject in an effort to "debunk." On the other hand, the Lincoln pictured here is not the school child's saint; he is a normal man with the average amount of human qualities that manifested themselves at times in mistaken or shrewd politics.

Mr. Beveridge has collected more facts

about Lincoln's life than have ever before been brought together, but the story is not yet definitive. Within a very few months after these volumes came off the press, the hitherto unknown love letters exchanged with Ann Rutledge made their appearance, and are now being published in the *Atlantic Monthly*. On December 30, 1928, the Kansas City *Star* published under copyright three recently discovered letters written by Lincoln to his one time fiancée, Mary S. Owens of Kentucky. I cite these instances merely to indicate that unexpected evidence is constantly turning up that may contradict seemingly well established facts. It may not be amiss to note here that the sentimentalized account by Katherine Helm, entitled *The True Story of Mary, Wife of Lincoln* [Harper and Brothers, 1928], does not quite ring true when compared with Mr. Beveridge's carefully documented pages dealing with Lincoln's married life.

All the outer manifestations and paraphernalia of scholarship are to be found in the volumes. The source for every statement is carefully indicated by voluminous footnotes. The bibliography fills twelve pages; the index is completely satisfactory. The account of every phase of Lincoln's life is exhaustive. Each individual with whom he formed significant acquaintanceship is characterized. Underlying causes for all Lincoln's actions, whenever it is possible for them to be factually ascertainable, are stated. Mr. Beveridge's work is a true and careful picture of political life in Illinois for the two decades and more during which Lincoln played so integral a part in it all.

DOUGLAS L. HUNT.

GARVER, F. B., and HANSEN, A. H. *Principles of Economics*. Pp. x, 726. Price, $3.00. Boston: Ginn and Company, 1928.

CURTIS, R. E. *Economics: Principles and Interpretations*. Pp. xviii, 878. Price, $4.50. Chicago: A. W. Shaw Company, 1928.

KEEZER, D. M., CUTLER, A. T., and GARFIELD, F. R. *Problem Economics*. Pp. viii, 719. Price, $4.00. New York: Harper and Brothers, 1928.

*Principles of Economics*, by Garver and Hansen, is an introductory text for college students in economic principles with a somewhat smaller amount of space devoted to current economic problems. Although economic theory is frankly faced, the book is clearly written and the principles are well illustrated. Value and price are recognized as the keystone of economics. The organization of production is briefly treated and much of the usual descriptive and historical material is omitted. The teacher will welcome the problems for discussion at the end of each chapter, but will regret the absence of collateral reading.

*Economics: Principles and Interpretations*, by Curtis, is also designed as an introductory text in economics, but for more mature students. The author has given a rather complete description of our economic life, in which business organization, its technical aspects and fundamental economic institutions are dealt with somewhat in detail. In addition, there is a very scholarly presentation of economic principles. Although some novel terminology and a number of modern refinements have been introduced, *e.g.* in the analysis of cost curves, in the main the treatment of economic theory is orthodox. This text seems too advanced for Freshman courses, but it will fill a real need of courses in general economics for more advanced students who are beginning the study of economics in later years. There are none of the usual pedagogical devices, such as topics for discussion and lists of collateral reading.

*Problem Economics*, by Keezer, Cutler and Garfield, represents still a third introductory text in economics. The book is divided into the following four parts: (A) The Setting of Economic Problems in the United States, (B) The Price System, (C) Division of Income and Group Efforts to Obtain Larger Shares, and (D) Comprehensive Schemes for Easing the Income Struggle. Each chapter consists of several selected readings, bound together by an outline and an introductory paragraph. This material is always interesting and sometimes instructive. The book represents an attempt to popularize economics for beginners, rather than to teach economic theory or economic development in an orthodox and systematic fashion. It also differs from the conventional treatment of

economic problems. At the end of each chapter are questions for discussion, but there are no lists of collateral reading.

S. H. PATTERSON.

ALLEN, JOHN WILLIAM H. *Al Smith's Tammany Hall: Champion Political Vampire.* Price, $2.50. New York: Institute for Public Service, 1928.

Two views of Tammany Hall are held by political scientists and social workers. One group regards it as a sink of iniquity and the source of every evil, political and social. Another, one may say an increasing one, regards it as a body once corrupt, now changing for the better, in many respects a real factor for democratic betterment. Dr. Allen presents the former view; William L. Cheney in his *Atlantic* article and Mrs. Henry Moskowitz in her articles on Governor Smith represent the other. The recent election would seem to indicate that the former view was the more popular one. While frankly, if not avowedly, a campaign document, Dr. Allen's book presents views and especially facts that must certainly be taken into account in reaching a conclusion about Tammany.

C. R. W.

DOBB, MAURICE. *Russian Economic Development Since the Revolution.* Pp. xii, 415. Price, $5.00. New York: Dutton and Company, 1928.

Mr. Dobb views the achievements of the Soviet Government in industry and agriculture not merely as an economic experiment, but as an experiment in "social engineering." The disastrous results of the period of "war communism," when economic policy was subordinated to military necessity, led Lenin to adopt the New Economic Policy, designed to restore the balance of interests between town and village. The instability of the currency and the increased divergence between industrial and agricultural prices—the famous "scissors"—created a need for further adjustments, finally formulated as "rationalization" and "scientific management" in industry and "coöperative collectivism" in agriculture. The problem which the Soviet Government must now face, according to Mr. Dobb, is not whether state industry will advance more or less rapidly than agriculture, but whether either in the town or the village old class differences and privileges are beginning to reappear.

Mr. Dobb's book, excellently organized and documented, is an authoritative contribution to the study of present-day Russia. A glossary of terms and a bibliography of Russian as well as English sources greatly enhance the value of the book.

J. G. MCDONALD.

*Survey of International Affairs, 1925.* Two volumes, and one supplementary volume. London and New York: Oxford University Press,* 1927–28.

These three volumes belong to an annual series on International Affairs published under the auspices of the Royal Institute of International Affairs. Volume I of the 1925 survey appeared last year. It gives an admirable summary of "The Islamic World" from the peace settlement to 1925 by Arnold J. Toynbee, Professor of International History at the University of London and Director of Studies in the Royal Institute. The thorough and somewhat detailed treatment of the world of Islam, however, took up the entire volume, making necessary a second volume for Europe, America and the Far East. This is by C. A. McCartney and others, while the supplementary volume of 235 pages, on the Chronology of International Events and Treaties from January 1, 1920 to December 31, 1925, is compiled by Miss V. M. Boulter.

In the treatment of the events and problems of the year in Europe, the question of security and disarmament, the lapse of the Geneva Protocol, the search for a new formula, the Locarno treaties and Germany's entry into the League, stand out conspicuously. Considerable emphasis is also put upon economic and social coöperation as developed through the International Labour Office, and the different commissions of the League of Nations. International waterways and the more distinctly regional problems of Europe, like the occupation of the Rhineland, Germany's commercial treaties, the relations among the Balkan

* American Branch.

States, the status of Danzig, German-Polish relations, the Little Entente, the German-Russian Commercial Treaty, the settlement of the refugees in the Near East, and the Graeco-Bulgarian dispute make up Part II of the second volume.

Part III is devoted to the Far East; to the new treaties of China, especially the one with the U. S. S. R., the Russo-Japanese Treaty, the Manchurian Railway, and a very interesting and serviceable biographical section on the leaders of contemporary China.

The part devoted to the American continent is taken up mainly with our relations with Latin America, the League of Nations, the Mexican difficulties, boundary disputes, and finally the liquor conventions. The volume concludes with a twenty-page appendix giving the text of the Locarno Pact.

Unlike the *Annual Register*, the *Survey* confines itself strictly to international affairs. The method is historical—"confined to facts," says Mr. Gathorne Hardy in his introduction to the *Survey* for 1920–23. It is, moreover, based on a conspicuous mastery of facts and forces and is, in the main, objective. Nevertheless, the viewpoint of the authors appears frequently. In Professor Toynbee's account of the Islamic World, for example, there is a "Note on Oil" (pp. 529–33) in which the criticism that oil played an unwarranted large rôle in the negotiations is vigorously refuted. According to him, whenever the critics are at a loss to find a satisfactory explanation of things, they always "smell oil," and raise "the cry of capitalistic exploitation." In the dispute over Mosul, neither Turkey or the Iraq (represented by Great Britain as the mandate power), made oil the basis of its policy. The author vigorously decries the mistaken statement that the legal and historical claims which cover the pages of diplomacy are only red herrings drawn across the path to attract attention from the struggle for oil.

On the whole the *Survey of International Affairs* is an excellent Annual written with a moderate British bias and with a fine feeling for the advantages of internationalism. Unhappily the work is already three years behind the events and drastic steps will have to be taken if the forthcoming volumes are to appear on schedule.

WILLIAM E. LINGELBACH.

THOMSON, MEHRAN K. *The Springs of Human Action.* Pp. xiv, 501. New York: D. Appleton and Company, 1927.

This is the best book in print on Motives. All the social sciences need more detailed and thoroughgoing studies on the expressions of human conduct. No two students of the problem are going to agree as to the proper proportions or as to the relative emphasis that should be given to different conduct urges, but to the reviewer the author of this book has painted his picture well. The book includes discussion of the urge of physical activity and autonomic acts and reflexive responses in their relation to motives.

Habits, instincts, emotions, feeling, ideas, interest, will, choice, and personality are discussed as motives. Self-regarding motives are outlined in detail. Special chapters are devoted to prejudice, to love, to morale as motives, and to social motives, values as motives, economic motives, aesthetic motives, acquired and substitute motives, motives of the subconscious mind, motives of autosuggestion, and motives of group suggestion.

CLYDE L. KING.

SPENGLER, OSWALD. *The Decline of the West.* Volume II, xliii + 507 pages. Price, $7.50. New York: Alfred A. Knopf, 1928.

Here at last is the concluding volume of the book which has been such a *succès fou* on its native heath. To be sure, it has received little acclaim in university circles, in spite of the publisher's blurb citing such men as Eduard Meyer and Manfred Schröter, but nevertheless it is well over the hundred-thousand mark in the German edition. That means tremendous popularity when one considers the fact that it first appeared in the lean years just after the war; when the English disease was at its height *Grütze* meant more than *Geist*, generally speaking.

The task of Englishing such a work is extremely difficult. If one does justice to the plastic, colorful style, the technical

philosophical terms are slurred over; if the conceptual skeleton stands out hard and clear, the beauty of the imagery must go a-begging. To cap all this, a host of new terms are introduced for which no English equivalents exist, and the translator is forced to the clumsy device of hyphenated words—"waking-being," "world-around," and so on. The present reviewer was compelled to turn to the original to make sense out of the first chapter, especially the section on "The Cosmic and the Microcosm." On page 5, for example, a series of errors are committed which make clear comprehension of the author's meaning almost impossible; the use of any good philosophical dictionary like Baldwin's, Eisler's or Clauberg-Dubislav's would have prevented such mistakes. *Empfinden* is not "feeling," and *Sinnlichkeit* can be translated, as Max Müller's version of the *Kritik der reinen Vernunft* plainly shows. But enough of these technicalities—in general one must say that the translation is adequate, although not distinguished.

Its chief importance for the social scientist does not lie in the cyclical theory of history it reawakens, but in the distinctions between urban and rural culture, between the secular society and the sacred community, which are found in Chapters II–VI and X–XII. There are also some interesting criticisms of democracy in Chapter XIII which the author has elaborated upon in his pamphlet, *Preussentum und Sozialismus;* all the aesthetes, *intelligentsia* and so-called liberals who have been slopping over about the "spiritual values" of the larger work should be compelled to read this pamphlet before hauling out their newest conversational *forte* for the benefit of those who can be awed by polysyllables.

The book will be a success in these United States—no doubt of that. It is full of brilliant *aperçus* and quotable phrases, and although fairly "heavy," is well adapted to the type of intelligence the various "Outlines" and "Stories" have nurtured. This does not mean that the serious student need not read the book—quite the contrary. He must read it, for upon him will devolve the duty of pricking the idealogical bubbles it will certainly produce. And in addition, there *are* many worth-while passages—insights which have value altogether apart from the arbitrary system into which they are jammed.

If you want to *know* Spengler, read this translation *and* the German original; then read Manfred Schröter's *Der Streit um Spengler* (Munich, 1922) and August Messer's *Oswald Spengler als Philosoph* (Stuttgart, 1922). But don't read too much—it may spoil your urbane conversational manner.

HOWARD P. BECKER.

RADIN, PAUL. *Primitive Man as Philosopher.* Pp. xviii, 402. Price, $3.00. New York and London: D. Appleton and Company, 1927.

As Dr. Dewey points out in his foreword, Dr. Radin in *Primitive Man as Philosopher* has stressed the existence of a definite intellectual class in primitive groups, these thinkers being proportionate in numbers and influencing the group in much the same way as the intellectual classes of civilized socieites. This stressing of the dynamic part played by the individual or small groups of individuals is new in anthropological literature though not new to the experienced field worker. It is an emphasis which might well be expected from a man who discerned the value of the life story of the Winnebago Indian, "Crashing Thunder," and who was alert to the desirability of publishing the part played by the individual in the development and spread of the Peyote Cult.

Drawing upon stories, myths, songs and autobiographies of primitive thinkers, Dr. Radin supports his thesis that the thing which differentiates the intellectual of primitive society from the philosopher of our own group is the body of written work and the technique of thinking elaborated on its basis. It is a thesis which would be supported by most anthropologists who have had experience in the field. Whether the reader of the book considers that Dr. Radin has proved his thesis or not the quoted songs, speeches and autobiographical material of primitive philosophers cannot fail to stimulate.

ISABEL GORDON CARTER.

SLAWSON, JOHN. *The Delinquent Boy: A Socio-Psychological Study.* Pp. iv, 477. Boston: Badger, 1926.

While the body of this treatise is too technical to interest the layman, the author's conclusions, based on a study of some 1,500 cases of boy delinquents in four New York state institutions, are interesting and significant. The book is a cautious and careful application of the statistical method in the field of psychology and sociology to determine "contributory strengths of various mental, physical, and environmental factors to juvenile delinquency."

The author sets up a false antithesis between the case-study and statistical methods, and his interpretation of his own statistics suffers from a lack of case-study materials which would throw some light on underlying mechanisms influencing his correlations. The book is an excellent piece of work despite this inadequacy, however, and a real contribution both to our information on the subject, and our knowledge of methodology.

The boys in the institutions for delinquents were shown to be decidedly inferior when compared with the unselected boy population in verbal-abstract intelligence. When these findings are corrected, however, by means of the use of control groups of unselected non-delinquent boys from the same racial, nationality, and social status as that from which the delinquents came, the inferiority of the delinquents in both respects diminishes to such an extent as to be negligible. Thus, it is probable that the causal relation between this factor and delinquency may be ruled out.

A study of the relation of intelligence to intensity of delinquency on the basis of the times arrested and the severity of delinquent careers was found to be negative. The author concludes, therefore, that the causes of delinquency among institutional juvenile boy inmates in New York must be sought in some other factor than defective intelligence as measured by tests given.

Using the Matthews revision of the Woodworth psycho-neurotic inventory, he concludes that "there is an intimate association between defective emotional make-up, as judged by the psycho-neurotic responses made to the questions on the inventory, and male juvenile delinquency."

After measuring the physical and psycho-physical factors of the delinquents, the author concludes that they do not present significant differences in weight or height from the non-delinquent population, and that these traits are not correlated either with the number of arrests or the severity of delinquent careers. He finds, however, that physical defects, such as those which are auditory and visual, are present to a much larger degree among the delinquents, "but no causal relation can be deduced between sensory defects and juvenile delinquency."

The author attempts to make correlations with certain environmental factors, some of which have often been reputed to be significant in causing juvenile delinquency. He concludes that "there is an association between abnormal marital relation of parents, *i.e.*, death, divorce, or separation among parents, and juvenile delinquency."

"There is a preponderance of inferior paternal occupational levels among delinquent boys as compared with the unselected population, and hence a relative preponderance of inferior social status among delinquent boys." "There is nothing to indicate in our data that certain environmental factors which go to make up social status are not . . . as important in their contributory strength to juvenile delinquency as the constitutional factor, intelligence."

There seems to be a slight association between the size of family (number of children) and delinquency, but the correlation is "too low to warrant serious consideration." "Our data as to the number of rooms per person in the home is based upon too few cases to warrant a definite statement," but it is probable that "delinquent boys do not possess less room space in their homes than non-delinquents." "There is a small relation between parentage (race and nationality) and severity of delinquent careers, and an appreciable relation between parentage and number of arrests of boys," but "the influence of racial or nationalistic parentage as an etiological factor cannot be large."

In conclusion the author emphasizes the fact that only trends have been ascertained

from his study. The author has made an important departure in applying the scientific methods to the study of boy problems, and his work will greatly assist others who are interested in determining the causes of juvenile delinquency.

FREDERIC M. THRASHER.

HERVEY, JOHN, G. *The Legal Effects of Recognition in International Law.* Pp. xiv, 170. Price, $3.00. Philadelphia: University of Pennsylvania Press, 1928.

This book presents a timely and comprehensive analysis of the British and American courts in cases involving the legal status of *de facto* governments, their laws and governmental acts, within the jurisdiction of the respective courts, during a period in which such governments are not recognized by the executive branch of the Government of Great Britain or the United States. The work involves a critical examination of the attitude of the courts of the two countries with respect to the capacity of unrecognized governments to sue, their liability to be sued, and the validity of their laws and acts in cases involving the private rights of persons or corporations, and should, in the words of the expressed object of the author, furnish a valuable "guide for future use in the determination of such cases and controversies."

N. D. HOUGHTON.

WOODWARD, W. H. *Profits in Bank Stocks.* Pp. 112. Price, $1.00. *Profits in Insurance Stocks.* Pp. 122. Price, $1.00. New York: The Macmillan Comapny, 1928.

Each of these monographs is about the proper size for a substantial magazine article. Following the lead of Smith, *Common Stocks as a Long Term Investment* and Van Strum, *Forecasting Stock Market Trends*, the author presents the possibilities of bank and insurance stocks as a profitable investment. The argument is convincing, the author pointing out what investors during the past have reaped in profits from appreciation in value and dividends (both stock and cash) paid. He has selected for the purpose the individual records of a number of leading banks and insurance companies.

The treatment in both books is elementary and presented in a pleasing, popular style; for these reasons, the books serve as excellent introductions into two fields of investment deserving of a wider acquaintance by the small potential investor.

A chapter entitled "How the Dealer Works," in *Profits in Bank Stocks*, is instructive, being something more than an elementary description.

WRIGHT HOFFMAN.

RISTER, CARL COKE. *The Southwestern Frontier, 1865–1881.* Pp. 336. Price, $6.00. Cleveland: The Arthur H. Clark Company, 1928.

This book treats certain frontier developments in Texas, New Mexico, and the Indian Territory just after the Civil War. About half the space is devoted to detailed accounts of Indian raids and the activities of the Army and the Indian agents. Later chapters deal with the buffalo, frontier life, the cattle industry, and the railroads. Such topics as frontier government, finance, and land systems are neglected. Much material from manuscripts, especially those in the Old Records Section of the Adjutant-General's office at Washington, is here made available in print. Some of the sources are used, however, without the greatest discrimination, as when the author cites (p. 246) what appears to be "blind" advertising by a stagecoach company to show that some people preferred the stages to the railroads. The style, often infelicitous, is that of the "typical" doctoral dissertation. The book is attractively printed.

DONALD L. MCMURRY.

KUCZYNSKI, ROBERT R. *The Balance of Births and Deaths.* Volume 1: Western and Northern Europe. Pp. xi, 140. Price, $2.00. The Macmillan Company, 1928.

This is the first of three volumes the Brookings Institution is issuing on population. The second study will deal with Southern and Eastern Europe, Africa, and Asia; the third with North and South America and Australia. All are to be issued within two years, and the three books will constitute an attempt to give the pertinent facts on the quantitative aspect of popu-

lation in a brief, non-technical manner. Speculation on the facts is to be held to a minimum.

One finds in the present volume a convenient compilation of tables dealing with births and deaths, women of child-bearing age, life tables, and fertility rates. They have evidently been gotten together with care.

The quantitative material is interestingly interpreted for the general reader. Great stress is placed upon the fact that population movements cannot be interpreted by a simple comparison of the number of births and deaths occurring in a given year. The age composition of the population must also be considered. As far as most of Europe is concerned, Mr. Kuczynski is of the opinion that present birth rates, while exceeding death rates, are not sufficient to maintain population at its present level. This is due to the abnormally small proportions of the present population either very aged or very young. Specifically, "With a fertility and a mortality as they prevail at present, the population of some smaller countries still shows a genuine growth, but the population of the larger countries, France, and especially England and Germany, is doomed to die out" (p. 4).

The book is written in a breezy style, at times bordering on the dramatic, but a good deal of scholarship went into its production. It is a worthwhile volume, indispensable to the student of recent population movements.

HUGH CARTER.

EDIE, LIONEL D. *Money, Bank Credit and Prices.* Pp. xiv, 500. New York: Harper and Bros., 1928.

Definitely espousing the institutional theorist's attitude in his analysis, Professor Edie refuses to place himself among either the quantity theorists or the antis. He insists that one dare not say that changes in M cause changes in P or vice versa. He shows that in recent times, over and over again, the quantity of money and changes in prices have acted and reacted on each other, and both have been acted upon by other factors such as the psychological and fiscal, and also by the cyclical and secular movements of business. No single explanation of prices will do.

The author believes that in the Federal Reserve Note we have an instrument almost ideally adapted to provide seasonal elasticity to our currency, but that it cannot provide the needed elasticity in the cyclical and secular periods. Control over these, the author believes, must be sought chiefly through a more courageous and far-reaching policy of the Federal Reserve authorities in their open market and discount operations.

The author shows a wide acquaintance with the vast literature on the subject, especially recent statistical studies. He has given us, in the reviewer's opinion, the best book on the inter-relationships between money and prices that has yet appeared.

ALBERT S. KEISTER.

JESSUP, PHILIP C. *The Law of Territorial Waters and Maritime Jurisdiction.* Pp. xxxviii, 548. Price, $9.00. New York: G. A. Jennings Co., Inc., 1927.

The author presents in two chapters the most exhaustive collection of data on the three-mile limit and bays which is to be found anywhere. The practice of the leading nations of Europe, Asia and the Americas are examined. Suitable portions of the text of the state papers and court decisions are incorporated in these chapters. Another chapter deals with the control over the high seas adjoining the territorial waters. The author declares that by custom it is now generally agreed that a state may exercise jurisdiction over such waters for fiscal, sanitary and defensive purposes. Four chapters are devoted to the effects of the prohibition laws of the United States upon foreign vessels and the liquor treaties. The author has drawn upon the files of the State Department and presents these questions in their true perspective for the first time. The painstaking analysis of the court decisions under the liquor treaties will be of interest to all practitioners. A final chapter is devoted to the codification of international law on territorial waters and maritime jurisdiction. The author examines numerous proposed codes, including that of the League's Committee of Experts,

and then presents one of his own which Professor Hyde declares "will be scrutinized by every maritime state."

Such a study is welcome at this time for three reasons: First, the work is an able refutation and challenge to those who regard international law as a waning pseudo science. Second, Mr. Jessup has made available, by his compilation, translation, and presentation, innumerable decisions, statutes and state papers which are not generally available. Third, the volume indicates that the valuable contributions of the future in this field will be along specialized lines.

This volume will be as welcome to the practitioner and judge as it is to the student of International Law. The author is an active member of the Bar of the District of Columbia, was at one time Assistant to the Solicitor in the Department of State and is now Assistant Professor of International Law at Columbia University. In the light of this training and experience the author is peculiarly fitted for the task which he has performed.

JOHN G. HERVEY.

HAYS, ARTHUR GARFIELD. *Let Freedom Ring.* Pp. xxii, 341. Price, $2.50. New York: Boni and Liveright, 1928.

One of the few Americans who believes strongly enough in the principles of freedom upon which this republic was established to spend a large part of his time in fighting for them, collects here a series of reports from various fields of battle; all of them interesting; some of them dramatic in the extreme. Here we find the story of the Scopes case in Tennessee, of Negro segregation in Detroit, of the *American Mercury* in Boston, of theatrical censorship in New York, of denial of the right of assemblage in Passaic, in Paterson and at the Vintondale Collieries in Pennsylvania and, finally, the tragedy of Sacco and Vanzetti.

Who, confronted with this evidence, can deny his conclusion? "There is no such thing as freedom of speech or assemblage concerning any subject that really matters," he tells us. "The Declaration of Independence has become so radical that the mere reading of it has led to arrest. 'I didn't say that,' said one victim, 'Thomas Jefferson said it.' 'Where is that guy?' said the policeman, 'we'll get him, too.'"

CLAIR WILCOX.

CALKINS, EARNEST ELMO. *Business—the Civilizer.* Pp. viii, 309. Price [illegible]. Boston: Little, Brown and Company, 1928.

It was probably inevitable that some advertising man should attempt to answer Stuart Chase. Advertising, Mr. Calkins tells us, is society's great meliorative agent. It lightens the housewife's lot. It improves the quality and lowers the prices of goods. It heightens morale and induces coöperation in business. It makes possible *True Stories*, *The Cosmopolitan* and *The Saturday Evening Post*. It makes many nice jobs for our college boys. It makes the world more beautiful.

To make things even more lovely, more products should be advertised, books, for example, and insurance. Bankers should lend more freely on the strength of advertising schemes. Newspapers should mention trade names in their news columns. Advertising copy should be improved. The author "firmly believes that advertising art offers as big a field to the artist today as ecclesiastical art offered in the fifteenth century." The da Vincis, the del Sartos, the Raphaels of the future will express themselves in tooth pastes, in garters and in roller-bearings.

If the author really believes all this, why does he include the curiously inconsistent chapter in which he bemoans the standardization of American life and looks with longing toward the picturesqueness of Europe? Aside from this chapter, his book should be highly pleasing to members of the advertising profession. The present reviewer is not a member of the advertising profession.

CLAIR WILCOX.

KNIFFIN, WILLIAM H. *The Practical Work of a Bank.* Seventh edition. Pp. xi, 618. The Bankers' Publishing Company, 1928.

This volume is valuable only to those who desire to be informed of the minute and voluminous details incident to the daily work of the employees of a bank. It

describes with painstaking particularity the activities within the bank of the tellers, clerks, bookkeepers, messengers, etc., and accompanies the text with numerous illustrations of the books of account and forms used. It is interlarded with anecdotes and moral reflections which give to the book a popular tone, although the anecdotes are apt and the moral advice is no doubt just.

The few and short introductory chapters on banking theory are inadequate and out of date in many respects in spite of the statement that, for the purposes of this edition, the book has been completely revised and re-written. No discussion is attempted of bank policy in its broader aspects, nor is any mention made of such recent developments as the movement towards banking consolidations and branch and chain banking. The extensive activities of banks in fields other than strict commercial banking are not touched upon, no mention being made, for example, of the trust, real estate or title insurance business.

Within the somewhat restricted field of the internal operations of the commercial department of a bank, the volume is informative and entertaining.

W. CARLTON HARRIS.

CORNELL, WILLIAM B. *Industrial Organization and Management.* Pp. 653. Price, $5.00. New York: The Ronald Press Company, 1928.

This book contains a wealth of material pertaining to the subject of *Industrial Organization and Management* treated primarily from an organization point of view. While individual chapters are well written both from the standpoint of clarity and material presented and in general are handled in an excellent manner, the general arrangement of the chapters could have been improved upon. The treatment of the subject almost entirely from an organization point of view results in the failure to emphasize properly such important subjects as simplification and standardization, the development of operating standards and managerial costs. On the other hand, more detailed information is presented on the work of individual departments, such as the Comptroller's Department and the Sales Department, than is ordinarily found in similar works. This book contains an excellent chapter on the work of the Power and Maintenance Division. There are many well-chosen illustrations, as well as a carefully prepared bibliography.

V. S. KARABASZ.

GRAYSON, THEODORE J. *Investment Trusts, Their Origin, Development and Operation.* Pp. xiv, 434. Price, $5.00. New York: John Wiley & Sons, Inc., 1928.

This book in 301 pages of text and 120 pages of appendix has described the investment trust in a complete and methodical manner. Almost equal portions are devoted respectively to British and American investment trusts. A separate chapter deals with such institutions as investment bankers, savings banks and insurance companies that accumulate funds of others and invest them in securities. Appendix A presents the texts of trust agreements and memoranda of association of several representative British trusts. Appendix B gives the texts of trust agreements and other documents pertaining to American trusts. There are presented seventeen tables of valuable statistical data concerning the investments, capitalization, revenues and expenditures of a group of British investment trusts. Similar data, but less inclusive, are presented regarding American investment trusts.

In his foreword the author states that he has hoped to afford "a considerable amount of definite information to all who are interested" in investment trust companies. There is valuable information in the book, which those who are interested may dig out if they have the will to do so. The book is hard to read. It is doubtful if readers for general business information will have the perseverance to struggle through it. It would have been better, perhaps, if the author had omitted some of the quotations and references that divert the reader's attention and break the continuity of the discussion without in any way making it clearer. These evidences of academic thoroughness, considered so essential in classroom exercises, hardly seem necessary in a book intended for the general public to read. Nevertheless, to those readers who

are interested in forming or participating in investment trusts the book is informative, although the author's analysis of his tables may not always answer their specific questions. On the whole, the work represents a creditable amount of research which is a distinct contribution to the literature of investment trusts.

CHARLES L. JAMISON.

AULD, GEORGE P. *The Dawes Plan and the New Economics*. Pp. xviii, 317. New York: Doubleday, Page & Company, 1927.

*The Dawes Plan Right or Wrong by One Who Knows Because He Helped Make It* might well be the title of this book.

The author says that economists "have overlooked the stupendous capital losses which Europe sustained in man power and invested capital." Since the economists have emphasized just this point so often, one may well surmise that this is the author's way of telling the world he is not an economist, a point on which few who read the book will disagree. He makes many statements he would not have made had he been trained in his thinking. The book, however, should particularly be read by those who think the Dawes Plan has to fail. For while the book is wholly one-sided, it has in it much worthy of the attention of the informed reader.

CHADDOCK, ROBERT E., and CROXTON, FREDERICK E. *Exercises in Statistical Methods*. Pp. vi, 166. Price, $1.75. Boston: Houghton Mifflin Co., 1928.

STANWOOD, EDWARD. *A History of the Presidency from 1788 to 1928*. Two vols. Pp. vi, 586; 543. Price, $6.00. Boston: Houghton Mifflin Co., 1928.

This two-volume work is a new edition of the study which was undertaken as "A History of Presidential Elections" in 1884, issued in 1898 under the title of *A History of the Presidency from 1788 to 1897*, and brought out in a two volume work in 1912, this new edition having additions and revisions to 1928. The additions follow the chapter on "The Republican Schism," which was added in 1916, and appear in the appendix in the form of conventions, candidates, platforms, and accompanying historical notes. The work of revision and addition was done by Charles Knowles Bolton.

# Operation of the Australian Dairy Produce Export Board

By Major J. Russell King, D.S.O.
Australian Dairy Produce Board, London

THE Australian Dairy Produce Board arose from the ashes of the war-time Government Control Board, under which abnormally high prices were obtained for all kinds of produce. These high prices made dairy farming a very payable proposition, given weather and other conditions suitable. However, times changed, de-control of all food products brought the producer back to pre-war level prices with after-the-war costs. The rationing of supplies, which was a most admirable function during the war, brought many to the verge of disaster once a free market was again assured. The price of dairy produce in the U. K. fell from 274/- to 112/- per cwt., or lower, and one can well imagine the plight of the dairy farmer, who having purchased land 100 per cent above its former value, with stock on much the same basis, having to face a reduction of over 100 per cent in the price of his manufactured article. Ways and means had to be found to keep the man on the land, and the Australian and New Zealand Governments did everything they could to assist by giving statutory powers to a board formed by the producers themselves (provided the producers) through a referendum, showed their desire for such assistance. In both of these countries the referendum was agreed to, and in Australia the Dairy Produce Export Control Act of 1924 was placed on the statutes; a board of twelve members were elected from amongst the producers and selling agents, with a government nominee, making thirteen in all, to take charge of export and marketing overseas (with the exception of butter shipped to the East).

Control in Australia actually came into force on July 1, 1925, and under it butter could not be exported from Australia without a license. All those interested in the industry are subject to the rules and regulations laid down by this Board, which is now known as the Dairy Produce Export Board of Australia; its charter is as follows:

1. To improve the organization of marketing dairy produce in the United Kingdom and on the Continent, and to open up fresh markets in any other countries.

2. Exercise supervision over the sale and distribution in all overseas markets, and bring about coördination amongst distributors and selling agents, chiefly in the United Kingdom. For this purpose the London agency be instructed to confer frequently with distributors and advise them of the prices which they consider should be obtained for Australian dairy produce—generally to endeavor to maintain prices on a basis equal at least to that ruling for the products in other countries.

3. Take action to establish and maintain the identity of Australian dairy produce in the retail shops and among consumers.

4. To ensure, as far as practicable, continuity of supplies.

5. Withhold butter and cheese when deemed necessary on overseas markets.

6. Advertising and propaganda to bring our butter and cheese directly under the notice of consumers, and for this purpose the London agency be authorized to expend such sum as the Board may from time to time allocate.

7. Arrange with the Commonwealth

Government for advances on butter and cheese.

Under this Act the Export Board had power to elect a London agency consisting of three members, two to be appointed by the Board and the third by the Government. The work of this agency is to supervise the sales of all butter made in London and to generally watch the interests of producers and exporters of butter from Australia.

The agency from its inception has worked very closely with the distributors in London and the provinces. Weekly conferences are held and matters pertaining to the industry discussed—such as prices, quality, continuity of supply, storages and other matters. No question of fixation of prices is attempted, the agency advocating a free market, clearing arrivals each week, thereby dispensing with storage and other charges; they feel that this method is in the best interests of producer and consumer.

Under the agency's supervision there has been less fluctuation on the market, and in this respect the producer has gained considerably. Opponents to the system of the Export Board assert that this stabilization is not altogether in the interests of the producer. They say that the fluctuations are greater, but on the average the producers would gain—we deny this. As a rule when prices are very high the producer has little or no butter to sell, when the slump comes it is usually at the time of his heaviest production, and speculators who have considerable sums of money at their command are able to step in and take large parcels off the market. When these large blocks of butter are taken from the market it generally advances £20 to £40 per ton. The producer's butter having been sold, he is naturally incensed when he sees someone else reaping the benefit of his labor, and who has made considerably more money than he out of the business, without the same risk, anxiety and labor.

*After Control.*—All importers receive their shipments on practically the same terms and conditions from the shipper, but the price at which they sell is now guided by conclusions adopted in conference between the London agency and the whole of the distributing houses, coupled with the methods of their own efficiency. These conferences are held weekly and the deliberations are based upon the consideration of all the statistics which vitally affect the position, the present, the near future, and the more distant future, together with the factors bearing upon the market for Australian butter. The statistics comprise:

Stocks of butter in the principal London cold stores.
Stocks of Australian butter at Hay's Wharf.
Previous week's gradings in Australia.
Previous week's exports from Australia.
Previous week's sales in Australia.
Average prices of all sales.
Previous week's cargoes afloat from Australia, New Zealand and Argentine.
Previous week's cargoes afloat from Australia, New Zealand and Argentine, corresponding week last year.
Expected arrivals during the coming week.

The average prices are obtained from the returns from distributors all of whom, without exception, are committed by their export licenses to furnish the London agency of the Board with these figures. The whole of this information enables the conference to form sounder opinions as to the prospects of the market than would be possible to any individual trader, but, of course, even opinions arrived at in this manner may sometimes prove incor-

rect. The influence the agency has exercised from its inception has been on the side of preserving a steady market, checking either a tendency to rush prices up and thus spoil the trade, or to slaughter goods during periods of depression.

This section of the Board obviously checks speculation as the speculator mainly depends upon reaping the difference between "slumps" and "booms." Some of the speculators go so far as to encourage a slump by selling goods at low prices in order that they may buy in larger quantities at the bottom, then turning their endeavors to forcing a rise and getting out near the top.

Slumps in the past have often arisen from heavy arrivals within a short period or during a holiday period. The policy of the agency is to regulate export, that is to withhold a certain percentage from shipment when production is at the highest, and ship these withheld butters when the season is falling away. It seems reasonable to conclude that such spreading over, "so that a glut is obviated in the flush of the season, whilst the scarcity of a later period is lessened," will stabilize values and prevent extreme swings of the pendulum. The only people to object at the moment to these methods are the speculators or large buyers who always endeavor to buy large quantities when the heavy arrivals made the glut possible.

*Present Method of Exporting.*—Exporters in Australia have to notify the secretary of the Export Board the quantity of butter exported by each ship, the grade and firm to which the butter has been shipped in London, or if sold f.o.b. or c.i.f. the buyer's name in the United Kingdom or elsewhere who has purchased.

*Transport.*—This phase of the industry is closely watched over by the Board, and recently the chairman of the Board in Australia has been appointed to coöperate with shipowners and the Government to consider any alterations of freights before they become effective. Quite recently the Board have secured for the producers in Australia a reduction in freight running into many thousands of pounds.

*Insurance.*—Marine insurances are pooled and divided amongst insurance companies operating in Australia, and in this respect a very great saving has been effected; a cover that is practically watertight, from the producers' point of view, has been secured from the Underwriters.

*Research.*—Research is also closely watched by the Board, who work in very closely with the Government Department, and at time of writing this article we have the chief commonwealth dairy supervisor and a very prominent factory manager investigating qualities of butter on the British market.

*Stabilization.*—A stabilization Committee has been formed throughout the Commonwealth, largely to watch other local prices and prevent interstate competition.

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# RADIO

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# FOREWORD

RADIO began its commercial development as a medium through which communication might be carried on with ships at sea. As a means of communication it has steadily increased in scope and importance. It was not until broadcasting, initially a by-product, appeared upon the scene, however, that public interest became manifest. The phenomenal growth of the radio industry since that date is almost without parallel. Public interest, at first almost wholly confined to broadcasting, is at the present time being intrigued by the possibilities of television and the discussion of the allocation of short wave channels. An increasing interest in the huge field outside the broadcast band is becoming apparent.

In the present volume a group of experts have attempted to portray in non-technical language a picture of the entire field of radio. As a background for the presentation, the development of radio from the laboratory to the broadcasting station is outlined and the more modern uses, such as television, trans-oceanic telephony, telephotography, etc., indicated. Then, preceding a study of the situation in the United States, a survey of the extent to which radio has come into use over the world is given. The services of the amateur, honored in radio circles but unsung by the public, are recounted by one of the most prominent of their number.

The unforeseen expansion of broadcasting presented a number of legal and administrative problems. Before Congress took definite action, chaos threatened if, indeed, it did not prevail. The legal situation prior to the enactment of a comprehensive statute is explained by an expert in legislation, who also analyzes the Radio Act of 1927. That act put a heavy burden upon the Radio Commission which it created. How the burden was discharged by the Commission is told by a member of that body.

One division of the *Supplement* is devoted to a discussion of the more important services performed by radio. Other services might have been included, but it is believed that those considered will serve to increase the appreciation of the benefits of the radio art.

The wide diffusion of radio waves introduces international complications as well as possibilities of greater international understanding. The regulation to which radio has been subjected in its international aspects and the part it has taken or may take in war, are pointed out. In the final article, the extremely important matter of the nationality of the control of existing international radio communication facilities—the more important because of the recent merger of British radio and cable companies to insure British dominance of the international electrical communication field—is presented.

That a single volume could tell the entire story of radio is not to be expected. Many volumes could be devoted to single phases treated in the present one, and others could be drawn from aspects necessarily omitted. It is hoped, however, that the accompanying articles will present a comprehensive view of the field of radio. If they do, the purpose of the volume will have been accomplished.

IRVIN STEWART,
*Editor in Charge.*

# The Development of Radio

By Laurens E. Whittemore

Member, Engineering Staff, American Telephone and Telegraph Company; Secretary of the American delegation to the International Radiotelegraph Conference of 1927

RADIO as we know it today is not the invention of any one person or of any small number of persons. It is rather the accumulation of the results of the experiments, thoughts and practices of a large number of individuals, each stimulated to make his contribution to a sum total of knowledge.

Radio communication has evolved from beginnings embedded in the purest of mathematical and physical sciences to one of the most far-reaching and sociologically significant of modern industrial activities. It has become a means of communication which is employed for almost every conceivable purpose from the business affairs of the financier to the amusement of children.

As an industry it now gives employment in the United States alone to about 200,000 persons, and as a service it counts among its direct daily beneficiaries perhaps a third of our population.

## The Beginning of Radio

Throughout the early and middle portions of the nineteenth century, workers in physics (then called natural philosophy) were learning some of the fundamental facts regarding the behavior of electric currents. Among these workers were some whom we now recognize as the outstanding physicists of their time, including such men as Ampere, Volta and Faraday. The fundamental work of these men led Clerk Maxwell, an English mathematician, in 1873, to the conclusion that high-frequency alternating currents, flowing in a circuit, would give rise to electric waves in the surrounding space. Maxwell's conclusion was based on an exact mathematical analysis which enabled him to predict the velocity of travel of the waves, as well.

These waves are the waves now used in radio communication and their existence was first experimentally detected by a German physicist, Heinrich Hertz, in 1887.

While most of the scientific effort before this time had been expended in the field of astronomy, this period witnessed a turning toward the study of electrical phenomena. The knowledge of laws of electricity, in conjunction with the fundamental laws of mechanics learned by the astronomers, has had a tremendous influence on the industrial history of the world since that time. Radio is but one of the examples of the complementary relation between mathematical and experimental effort in furthering human progress.

The contrast between these early beginnings and the present uses of the art is indeed tremendous. Hardly would Maxwell have believed that his mathematical theory would be used in the determination of the strength of signals to be expected at a particular distance from a broadcasting station of a given power. How difficult it would have been for Hertz to conceive of the use of the complicated electrical apparatus for the quantitative measurement of radio field intensities, his own equipment having been little more than a ring of wire broken by a gap at which a tiny spark was produced.

### LONG DISTANCE RADIO COMMUNICATION

Perhaps the most important step, from the experimental use of high-frequency electric currents to the practical employment of these methods in long distance radio communication, was the adoption of a ground connection, thus making use of the earth as one portion of the transmission circuit. This was done by Marconi and others a few years before the beginning of the twentieth century.

At about that time, also, a device was developed which would detect the presence, in a receiving circuit, of high-frequency currents far too weak to produce a spark. This was the "coherer" devised by Branly, which consisted of fine metal filings loosely packed in a small glass tube. From that time on extended studies were made by many workers in an effort to develop a more sensitive receiving or "detecting" device. Among the devices subsequently developed were the various types of magnetic, electrolytic and crystal detectors.

Many people have the mistaken impression that the word "wireless" refers to telegraphic communication and that the word "radio" refers to telephone communication and in particular the broadcasting of voice and music as we have it today. In reality these two terms are interchangeable, neither one being exclusive of the other. The use of the term "radio" is becoming more general since it is more descriptive of what actually takes place in the radiation of electric waves from a transmitting antenna.

### PRINCIPAL STEPS IN THE TECHNICAL DEVELOPMENT OF RADIO

In the early days of radio, something over 50 years ago, the laboratory research efforts were closely associated with the study of other natural phenomena, and experiments with high-frequency spark discharges were used as a means for confirming the validity of the electromagnetic theory of light. Even up to the present time, radio has maintained its community of interest with other physical sciences, for knowledge of radio transmission bids fair to be one of the most useful means of studying the nature of that part of the atmosphere which is beyond the reach of airplanes, balloons or kites.

The earliest technical methods employed in radio transmission were, naturally, relatively crude, the waves being sent out from a circuit in which a spark discharge was produced. The irregular and highly damped nature of these sparks resulted in the production of a relatively extreme amount of interference from a given transmission, and efforts were early made to minimize this undesired effect. The removal from the antenna of the effect of the spark after its initial occurrence was one of the means taken to reduce this interference. The comparative youth of radio is evidenced by the fact that a large number of radio stations, particularly in the marine service, still exist in which the earliest types of commercial equipment are employed.

The use of the electric arc as a means for converting direct current into high-frequency alternating current, developed in 1902, was a notable step toward the generation of radio waves which are much less productive of interference. Most of the high-power radio stations engaged in trans-oceanic communication, up to about 1915, employed this type of transmitter, and a number of arc stations are still in use.

By about 1915 improvements had been made in rotating electrical generators which made possible their adaptation, with suitable rather radical

changes in design, to the production of currents of much higher frequencies than had previously been developed from such machines. These high-frequency alternators, built to handle power of a few hundred kilowatts, contributed a reliability which, for 10 years or more, has made them the backbone of the long wave circuits forming the basis of the existing intercontinental radiotelegraph networks.

Up until about 1915, the receiving devices employed were comparatively simple and crude in the light of the performance of present-day vacuum-tube detectors and amplifiers.

### VACUUM TUBE

The vacuum tube, having its beginning in the discoveries of Edison, Fleming, and DeForest, served first to provide a sensitive and reliable detector, and second to provide a satisfactory and easily controllable transmitting mechanism. Edison discovered the effect of the emission of electrons from a heated filament. Fleming, by inserting a plate with a heated filament in an evacuated glass tube, produced a vacuum-tube rectifier or detector for high-frequency alternating currents. DeForest inserted a third electrode, the grid, and thus produced a tube which serves also as an amplifier or as a generator of alternating current.

The use of the vacuum tube as a very powerful amplifier has made it possible to receive signals far weaker than those previously required. This advantage is accompanied, however, by a corresponding amplification of the noise associated with natural electrical disturbances or "static" and has thus put a greater emphasis on the problem of separating the desired signal from the undesired signals or effects.

The vacuum tube, first a small device employed for simply detecting the presence of radio waves, has taken on many forms and is used for detection, amplification, modulation and generation. The sizes in commercial use now range from those which will handle only a few thousandths of a watt to comparatively large water-cooled tubes which will handle power of 20,000 watts or more. Larger tubes have been made experimentally.

Relieved from the necessity of indefinitely increasing power at the transmitter, stimulated also by the increasing congestion in the portion of the radio frequency or wave-length range which had previously been usefully employed, and given a tool, the vacuum-tube detector and amplifier, by means of which quantitative measurements of radio transmission were made possible, workers in radio soon began to explore the region of higher frequencies or shorter waves. This region, while not employed for practical purposes up to about 1920, is, strangely enough, the very range in which the early experiments of Hertz and others were conducted.

### FIELD FOR IMPROVEMENT

The most fruitful field for improvement at the present time is now recognized as in the ether itself, or, more concretely, in the design of the antennas which are used for getting the energy into and out of the ether. The improvements, which have already been made in this feature in the establishment of certain important radio communication systems, have been so great as to correspond in effect to a hypothetical increase in the power of the transmitter amounting to 20,000 times.

Every radio transmission occupies a band of finite width in the frequency or wave length spectrum. From the time, only 15 or 20 years ago, when the principal need was to enable ships to

make contact and practically all stations were required to operate on one wave length—600 meters in the marine radio service—the number of stations operating simultaneously has so increased that radio engineers are greatly concerned because of the limitations which are involved in the range of the useful frequency space available. In spite of the fact that there are perhaps 3,000 channels available in the frequency range now employed for radio communication, it has become necessary to allot portions of this range to various services by international agreement.

The fullest use of this crowded transmission medium requires the greatest possible constancy in the operating frequencies of radio transmitting stations. Perhaps there has been no single contribution to this important problem so effective as the development of the piezo-electric crystal for use at radio frequencies. Thus a minute slab cut from a quartz crystal has, since about 1925, become an essential part of most modern radio transmitters.

Those who are working in other fields of science, such as geophysics and meteorology, are finding radio methods and the results of measurements of radio transmission to be very useful in their efforts to learn more of the constitution of rock strata beneath the earth's surface and of the electrical characteristics of the upper atmosphere. Measuring devices, amplifiers and other instruments, whose development has been stimulated through their wide application in radio research, are proving valuable tools in the search for information in widely scattered fields ranging from biology to astronomy.

## EVOLUTION OF PUBLIC INTEREST

Interest in the early experiments with radio or "Hertzian" waves was almost entirely of a scientific nature. The questions asked were: How are the waves radiated and transmitted? How do they affect the coherer or other receiving device? and, How can laboratory apparatus be arranged to "tune in" one wave and "tune out" another? The question was not: How can these phenomena be applied to certain practical uses?

This scientific interest in the mechanism of radio communication has never diminished, and even though later developments have made possible the wide application of radio to everyday affairs the scientist does not lack for problems—notably those of the transmission of radio waves through space—whose answers are still unknown. Fortunately, however, the present ability to make quantitative measurements both of high-frequency currents in radio circuits and of the intensity of radio waves received at any point, is now making the knowledge of these phenomena much more complete and is enabling workers in this field to draw conclusions and make estimates of probable performance in a way which was previously entirely impossible. This means that radio communication is now on an engineering basis and has progressed far from the empirical status of little more than a decade ago.

The first practical application of radio was for communication between ships and from ship-to-shore, and the public interest is still stimulated by every event which emphasizes the relation of radio to the safety of life at sea. From the time of the collision between the *Republic* and the *Florida* in 1909, to the loss of the *Vestris* in 1928, radio has played its part in bringing aid to those who would otherwise have been lost. The *Titanic* disaster served as the principal stimulus to the first international conference at which specific rules were set forth for the

equipment of vessels with radio as a safety device. To the satisfaction of all those who are working in radio, it may be truly said that with very few exceptions the radio operators on vessels in distress have shown their right to be listed among the heroes of the sea.

In 1910 only about 1,500 merchant vessels in the entire world were equipped with radio; the shore stations for communication with these ships numbered only a few hundred. By 1928, the number of ships equipped with radio had increased to over 12,000 and the number of shore stations to over 1,500, the latter being found in all parts of the world.

The formal recognition of the usefulness of radio as an agency of commerce is indicated by the succession of legal enactments of which it is the subject. The first general International Radio Treaty was signed in 1906. It was revised at a conference in 1912. It related almost exclusively to the use of radio on shipboard, primarily for insuring the safety of life and property at sea. The principal countries of the world have enacted national laws for the regulation of the use of radio on shipboard, the first general legislation on this subject in the United States having been the Ship Act of 1910 followed by the Radio Act of 1912. The most recent revision of the International Radio Convention and Regulations, signed at Washington in 1927, is still occupied to a major extent with provisions relating to the mobile radio service and an International Conference on Safety of Life at Sea, to be held in 1929, will have as one of its important problems the modernizing of the regulations which specify the classes of vessels upon which radio equipment shall be required.

The comparative ease with which simple radio transmitting and receiving apparatus can be constructed and the freedom from restrictions on its use in the United States and in some other countries have resulted in the widespread employment of radio as a means of amateur communication between individuals. While radio amateurs have, in the past, been required to operate on wave lengths or in frequency bands not considered the best for practical or commercial radio communication, they have become noted for their energy in taking this limitation as a challenge to do pioneer work. As a result the amateurs have been in a large measure responsible for focusing attention on the usefulness of the short-wave range which had previously been considered as waste territory. The number of licensed amateur radio transmitting stations in the United States has increased from 1,200 in 1913 to 17,000 in 1928.

The personal contacts developed through amateur communication, at first between persons in neighboring cities, later by those in widely separated parts of the country, and now between amateurs living on different continents, are playing a part in the social evolution of the world which, while intangible, may be extremely effective.

### BUSINESS AND COMMERCIAL USES

The business and commercial uses of radio are more prosaic but, nevertheless, are extremely important. Transoceanic radiotelegraph communication over long distances between fixed points had its beginning in 1901, when the letter "S" was successfully transmitted from the station at Poldhu, Ireland, and received at St. John's in Newfoundland. From this simple beginning, a little over 25 years ago, there has developed a world-wide network of long-distance radiotelegraph circuits.

In 1904 radiotelegraph news service to ships was begun by which it became possible to publish daily newspapers on transatlantic liners.

During the World War excellent use was made of a number of transoceanic radio circuits which then existed supplementary to the cables. The military needs stimulated the development of portable equipment for field use, as well as equipment for use on aircraft and submarines. Stimulus was given also to the development of radiotelephony, particularly with low-power sets for short-distance communication.

The extent to which modern business will find it useful to employ the methods which have been developed for transmitting a facsimile or picture of the message, diagram or other material offered for transmission can only be foreshadowed at the present time.

The culmination of the accomplishments of radio, so far as the present popular interest is concerned, is in broadcasting. The programs, covering the range of music, dramatic and other literature, amusement features, and market and other news services, form a contribution of the most far-reaching nature to the solidarity of the people served by a given broadcasting system.

While there were a number of earlier tests of radiotelephone transmission of music and speech, it was not until 1921 that a broadcasting station in the United States began the transmission of regular scheduled programs intended for reception by the general public. The subsequent seven years have seen the springing up of some 700 broadcasting stations in the United States and have seen the establishment of broadcasting service in many other countries, first in Europe and later in other parts of the world. The supplementary use of short waves for broadcasting is developing a world-wide interest in the reception of programs from distant parts of the earth.

One of the outstanding applications to which radiotelephony has been put during the past few years is the establishment of commercial telephone circuits, connecting the telephone systems of North America and Europe so that two individuals whose telephones are connected to these systems may converse with one another as in the case of an ordinary long distance call. Additional circuits under development or in experimental operation will, undoubtedly, during the next few years, serve to establish telephone connections between all of the important continental areas of the earth.

Another important use of radiotelephony is for communication with aircraft. On account of the speed of travel of aircraft and the importance of communicating with the pilot himself, it seems probable that telephony will be largely used for the transmission of weather information and flying instructions from ground to plane.

The perfection of radio technique and the development of equipment for its principal applications have made possible the use of radio for still other purposes. Among these may be mentioned the transmission of radio signals for the determination of differences in longitude, the use of radio as an aid in geophysical explorations, its use for communication with railroad trains and other moving objects, and its use as an emergency means of communication as an auxiliary to ordinary wire communication systems.

What the future will bring forth as to television, no one can, at this time, predict with certainty. It is fundamentally true, however, that in addition to some apparatus complications, a much wider frequency band is necessary to secure results which are pleasing

to the eye than is required for satisfactory sound transmission.

As a consequence of the popular wonder at the accomplishments of radio there is a tendency on the part of some to make predictions that radio can be used for the most fantastic and unreasonable things, at least, they are unreasonable from the standpoint of present engineering knowledge. But when so much has been done, it does not seem unreasonable to expect that there will be some measure of advance from its present state of development. It seems to be axiomatic, however, that the increasing congestion in the use of frequency space will bring about correspondingly increased limitations on those radio services in which there is, comparatively, a smaller public concern or which can be carried on by other means.

### THE GROWING INTERRELATIONSHIP OF RADIO AND WIRE COMMUNICATION

To an increasing extent, particularly where the ordinary commercial communication services are concerned, a given member of the public does not care so much whether his messages are sent by radio or wires as he does for a rapid and effective service. In the case of broadcast programs having a nation-wide coverage, the speech or music originating at a given point is transmitted by wire to the several broadcasting stations, where it travels by radio to numberless receiving sets. Part of the international telegraph business of the world consists of messages which travel part of the way by wire and part by radio. A substantial proportion of the messages originating on ships are transmitted to land by radio and are then carried to their final destinations over wire circuits. In the further progress of the development of communication each medium of transmission may be expected to be used primarily for those purposes for which it is best suited.

Radio employs throughout the world a common transmission medium which is subject to vagaries and irregularities not within the control of man. As a result, radio has some inherent limitations to offset in part its advantages of broadcast transmission and its ability to span great stretches of water or to reach mobile objects. Much has been learned of the usefulness of radio and also of its limitations. Its economics are being better ascertained, and knowledge of all of these aspects is essential in order to determine where radio can best play its part in the fulfillment of the communication needs of the world.

# Recent Technical Developments in Radio

By Arthur E. Kennelly

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RADIO communication has already exerted astonishingly great influences upon human affairs. Nevertheless, this influence has only recently become active, and it is probable that it will be still more marked in the future. In particular, the basic science of electro-magnetic waves, and the dependent applied science or technic of radio-communication, have been undergoing rapid development in recent years. Their effects on the world are likely to be very notable as time goes on. This article aims at presenting to non-technical readers, an outline sketch of recent technical developments. From this rough picture it may be possible to form some idea of not only what has already been technically accomplished, but also what may be coming through the picture in the near future, as time brings out the colors on the canvas. We can only expect to see but a little way into the forward scheme of things; because new discoveries and inventions may completely change both plans and progress.

## Ocean Telephony

One of the outstanding technical developments during the last few years has been the successful establishment of radio telephony across the Atlantic ocean. Telegraph communication by submarine cable, between New York and London, was first established temporarily in 1858, and permanently in 1866. Transatlantic telephony, however, was never effected by cables as constructed during the nineteenth century. Short undersea cables were successfully employed for telephony; but the rapidly fluctuating electric currents carrying the voice, became too much attenuated or weakened in transit, to carry speech over thousands or even over hundreds of kilometers. The writer well remembers witnessing in 1877, an experiment in submarine telephony between Cornwall, England, and Vigo, Spain, a distance of about 900 kilometers over the surface of the sea. At that time the Bell telephone was a new scientific instrument, about which but little was accurately known; and only a few Bell telephone hand receivers were then in existence in Europe. One of these receivers was connected to the Vigo cable, at Porthcurno, a station near Land's End, Cornwall, and another was connected at the same hour to the other end of the cable in Vigo, without batteries, carbon transmitters, or other apparatus. A year or two later, the experiment would have been looked upon as amusingly hopeless; but at that time, lack of technical knowledge encouraged hope. After half an hour of testing and shouting into the hand-phones, supplemented by telegraph messages over an alternative route, it was quite evident that no speech could be received over that length of standard submarine cable, with the simple receivers thus connected.

Encouraged by partial success in 1915, to broadcast audible speech from Washington, D. C., to both Honolulu, Hawaii, and Paris, France, simultaneously, the American Telephone and Telegraph Co., after the close of the World War, developed the technic of long-distance radio telephony. Many difficulties had to be overcome on

both sides of the Atlantic before satisfactory radiotelephonic conversation could be exchanged between New York and London. Such communication varies from time to time, due not only to accidents, electrical defects and local disturbances, but also to atmospheric disturbances over the route, which may be collectively described as *radio weather*. In order to provide commercial telephone service, it was necessary to prepare for transmission on the reasonably worst day of the year, and not merely on the average day. After many months of daily testing, the service between London and New York was formally opened, with appropriate ceremonies, in January, 1927. It has since remained in regular operation, except for unusual meteorological conditions, such as those accompanying aurora borealis.

On any such radiotelephone circuit, there is always a certain amount of noise in the receiver, due to extraneous electrical disturbances, among which, "static" disturbances play a leading part. The voice has to be transmitted intelligibly through and over this noise; so that the signal-to-noise ratio is an important technical measure of such telephone circuits. In order to reduce the noise and static, the radio receiving stations have been carried up north.

The American Radio transmitting station is at Rocky Point on Long Island; while the receiving antenna is at Houlton, Maine, near the Canadian Border. The British transmitting station is at Rugby, near London; but the receiving antenna is at Cupar, near Dundee, Scotland. A person speaking from any city in North America, say San Francisco, is connected with the main terminal in New York, by ordinary wire telephone circuit, extended to Rocky Point. There the electric power of his voice is automatically magnified millions of times and delivered to the air. The radio waves spread over the seas, and an extremely minute fraction of this radiated voice power is picked up in the receiving system at Cupar. This is again automatically magnified, and carried by telephone underground wires to London; whence it may again be carried to the city of destination, where the other party is listening. His reply is carried back to London, by the regular telephone wire system, thence to Rugby, where it is enormously amplified and put upon the air. The radiated waves spread out in all directions. A minute fraction of the scattered wave energy is picked up at the receiving antenna in Houlton, Maine. This is again amplified and carried to the New York central office, after passing through several amplifiers on the way. From New York, the voice currents are led over the regular long-distance wire channels to San Francisco.

In this communication, the bee-line distance across the ocean, covered by the radio links, is about 5,000 kilometers. Moreover, not only can the communication be extended from London to any city in Great Britain within long-distance telephone range; but it is also often carried to the continent of Europe, through short submarine telephone cables and then extended to many European cities. It is thus possible to place a subscriber in Mexico City or in California, in conversation with a subscriber say in Berlin, Germany, via the transatlantic radio link between New York and London.

### EARLY EXPERIENCES

In the earlier days of transoceanic radiotelephony, the drawback existed that the conversations were literally broadcast, and any person in the radio vicinity, which might have a radius of hundreds of kilometers, might listen in and enjoy the supposed private talk.

Not many years ago, before the Island of Santa Catalina, off the California coast near Los Angeles, was connected with the mainland by submarine telephone cable, it was possible to communicate by telephone with Santa Catalina through a radio link over about 50 kilometers of Pacific Ocean. Although the wave length used on this radio link was outside the regular broadcasting limits, any radiolistener could overhear the conversation, by the use of appropriate receiving apparatus. There used to be a telephone subscriber at that time in Santa Catalina, who occasionally put in a long-distance call for a member of her family in Los Angeles. She was very particular that the call should be made at a certain precise evening hour. The reason for this clock precision was not then apparent; but it transpired that another member of her family, living in Oregon, was a radio amateur with a good receiving set. By listening in at these clock times, on the radio wavelength of the Catalina link, he could overhear the family conversation on the coast of California. This may have been legitimate eavesdropping; but much mischief might evidently pour through the same opportunity.

The transatlantic radio link in telephony between Europe and America was, in its early stages, open to the same objection that eavesdroppers could listen in. More recently, however, this defect has been overcome, and the conversation over the Atlantic has been made very nearly eavesdrop proof. A listener may be able to recognize that conversation is going on; but it sounds like jargon. The received waves have to undergo a special process of electrical treatment before intelligibility is restored to them.

### UTILIZATION OF SHORT WAVES

Prior to the World War, emphasis was placed, for effective long-distance radio communication, upon long waves; *i.e.*, on waves of say more than one kilometer in length. Wave lengths down to 200 meters were used; but these were regarded as more particularly applicable to short-range service. Below 200 meters, the wave lengths were left open to amateurs and experimenters. It was generally believed that such short waves were of little value for long-range service.

The amateurs and experimenters gradually developed the short waves below 200 meters. In the winter of 1922–23, the amateurs succeeded in receiving messages over the Atlantic, on wave lengths in the neighborhood of 100 meters, an achievement that aroused much surprise. Since that date much attention has been given to short waves down to 15 meters and even less. The international radio conference at Washington in 1927, allocated all wave lengths between the limits of 30,000 meters and 5 meters, assigning lengths below 5 meters, as well as certain bands below 22 meters, to amateurs and experimenters. Some of the short waves between 120 and 20 meters have proved very serviceable for long-range radio communication, using relatively short sending and receiving masts, and relatively little power; although the conditions of best operation for these shorter waves are somewhat different from those of the long waves.

### CHANGE FROM WAVELENGTH TO FREQUENCY

Since the introduction of commercial radiotelegraphy, it has been recognized that waves might be defined either by their lengths or by their frequency of reversal. The speed of radio waves is accepted as nearly 300,000 kilometers per second. If the sending station emits waves at the rate of 300,000 complete reversals, or cycles

per second; then each wave will be one kilometer long; whereas if the emission frequency is raised to say 600,000 cycles per second, the emitted waves will be half a kilometer, or 500 meters in length. One of the two quantities—meters of wave length, and cycles per second of frequency—being given, the other is immediately known by the fact that the two multiplied together, give as the product, the transmission speed of 300,000,000 meters per second; or if greater precision is desired, 299,820,000. In the earlier stages of the art and science, emphasis was placed upon the wave length, and the frequency was regarded as of secondary practical importance. More recently, however, it has come to be recognized that the allocation and separation of waves is more clearly and logically defined in terms of frequency, thus placing the wave length in the second place. A specified service, such as broadcasting, is better defined by a frequency band than by the corresponding wave length band. It has therefore been generally agreed to assign and specify waves in terms of their frequencies. Thus, the international call of distress at sea is on the frequency of 500,000 cycles per second or 500 kilocycles per second while the corresponding wave length of 600 meters is the subordinate factor. Again, broadcasting frequencies lie between 550 and 1500 kilocycles per second or approximately between 545 and 200 meters.

### PIEZO-ELECTRIC OSCILLATORS

Not only are frequency meters in very general use for keeping radio stations on their proper allotted frequencies; but automatic devices have recently been developed for holding the emission frequency of a station at the correct number of kilocycles per second. A thin strip of quartz or rock-crystal, cut from the crystal at the proper angle, has the property of becoming electrified by mechanical pressure or squeezing. If the pressure is alternately applied and released, the crystal slab will develop an alternating voltage. But any voltage externally applied to the slab, compresses it very slightly by attractive forces. It thus becomes possible to harness such a crystal slab to a battery, with the aid of a vacuum tube, in such a manner as to cause the slab to set itself in vibration and to maintain this minute trembling movement indefinitely, the energy being derived from the battery or other electric generator. The vibration frequency of the slab depends upon its dimensions, and these can be adjusted within fairly wide limits, so as to permit the crystal to maintain just the right frequency. If the slab is kept at constant temperature, it can hold to its self-imposed frequency of vibration with extraordinary fidelity. This vibrating crystal can then be made to control and maintain the emission frequency of the station where it is kept.

### TELEPHOTOGRAPHY

Portraits, drawings and printed or written matter are now transmitted electrically in commercial wire and radio service. In principle, the plan is by no means new; but the details of the modern method are novel and interesting. The picture to be transmitted is first photographed on a positive transparent film of standard size. Dark areas in the film are naturally more or less impervious to transmitted light; while light areas are, on the contrary, correspondingly transparent. The prepared film is of such a size that it folds around a horizontal glass cylinder which is driven at a fixed speed by a little electric motor in the transmitting apparatus. As the cylinder rotates, it also moves slowly in

an axial direction, by a screw feed. A narrow beam of light impinges on the rotating cylinder, so as to pass through a small area of the film. Inside the cylinder and film is a sensitive photoelectric cell, a device which emits an electric current only when light falls upon it, the emitted current being roughly proportional to the intensity of the light received. In all the clear areas of the film, a strong light can pass from an outside fixed lamp to the inside fixed photo cell; whereas the passage of dark areas in the film will intercept the light and momentarily shield the cell. The fluctuating current from the cell is amplified in the transmitting apparatus and sent out along a line circuit to the receiving station. Here there is also a horizontal electrically driven revolving screw cylinder, just like the first; but carrying a sensitive photographic film. A narrow beam of light from a fixed lamp near to the revolving cylinder is focused upon the surface of the rotating sensitive film. The intensity of the incident light is controlled by the current received from the line. The film in the receiving apparatus thus becomes photographically exposed, point by point in correspondence with the record on the film at the sending station, provided, of course, that the two cylinders are kept exactly in isochronism, or go round exactly in unison. The finished receiving film is then a photographic negative of the sending film. As soon as the receiving film is developed, fixed and dried, it may serve for the original of any desired number of positive photographic copies at the receiving station. Substantially the same process is used when the two stations are in radio communication, instead of being connected by wire.

Telephotography is very convenient and effective, when the message to be sent is in an unusual language, code, or hieroglyphics; also when columns of figures have to be transmitted with great care. Indeed there are some who predict that the standard telegram of the future will become the facsimile reproduction or telephotogram, whether by wire or wireless.

### TELEVISION

Television is the instantaneous transmission to a distance, of the image of an object, so that the person at the receiver can see the reproduced image and thus, in a certain sense, see the object itself. As ordinarily understood, electric television is effected by radio. There is a crude resemblance between the principle of television and that of telephotography. In both there is a rotating pair of similar elements running in close synchronism, so that corresponding points in the sent and received pictures are simultaneously projected. Whereas, however, the photographic films in telephotography may take several minutes to execute from beginning to end, in the case of television, the two pictures must be completely covered in about one sixteenth of a second, in order that the eye may see the whole surface as a single picture.

In one form of the apparatus, a bright beam of light is caused to travel in a definitely repeated manner, over the object to be televiewed, with the aid of a series of holes in a rapidly revolving disk. The light, reflected from successive areas of the object, is directed to a photoelectric cell, in such a manner that bright spots on the object stimulate strong currents in the cell, and dark spots feeble currents. These currents, greatly amplified, are delivered to the air at the sending mast. A minute fraction of the emitted wave energy is picked up at the receiving mast and delivered, after reamplification, to control the instantaneous intensity

of a beam of light from a local source, directed through holes in the receiving disk, to corresponding parts of the receiving picture. The bright and dark parts of the sending picture will then reappear as corresponding bright and dark parts of the receiving picture. In this way, several thousand successive points in the sending picture will, one by one, be reproduced in the received picture, all run over sixteen times per second. Changes in the form and brightness of the object will simultaneously appear in the reproduced image at the receiving station.

Although television has been repeatedly and strikingly demonstrated, it is still in an experimental stage. It remains to be seen how far it can be introduced commercially.

### AIDS TO AERIAL NAVIGATION

The arch-enemy of airships is fog. Clouds lie in layers, and an airship can fly either above them or below them; but a thick fog covering the ground, and rising to a considerable height, makes landing fields invisible, and greatly adds to the difficulty of landing. Powerful searchlights may penetrate a fog for some distance; but the pilot must descend fairly near to the landing field in order to come within their range. The electric waves from a radiobeacon pass readily through fog, and thus offer much needed means for guiding a fog-enveloped airship.

A recently developed form of aerial navigation radiobeacon, consists of a pair of vertical loops of wire, erected together, crosswise or in two intersecting vertical planes, at or near the landing field. Suppose that the regular course of an arriving airship is from the northwest. The two loops may then be erected one north and south, the other east and west. The course of the arriving airship will then lie midway between them. Such radio loops emit electric waves that are strongest in the direction of their respective planes. The two loops, being actuated together into similar and simultaneous wave emissions, the oncoming ship, if provided with a suitable radio receiving antenna and apparatus, may begin to detect waves from the beacon at a distance of say 150 kilometers. If the pilot has wandered off the course towards the north, he will be approaching the plane of the north-south loop, and its signals will be louder; while he will be approaching more nearly broadside on to the east-west loop, and its signals will be fainter. He will therefore steer more to the west until both sets of loop signals come in equally strong, when he knows he is on the right bearing, midway between the loops. By keeping the two sets of signals in balanced strength, he can keep on the true course, even although the ground is entirely invisible from fog.

The acoustic reception of such radio beacon signals, has the disadvantage of claiming a considerable share of the pilot's attention. A visual form of receiving instrument has more recently been developed, which makes less demand upon the pilot's watchfulness. A pair of metal reeds are mounted side by side in the receiving set, behind a glass window, and in front of the pilot's seat. Each is arranged to be kept in visual vibration by a small electro magnet connected with the airship's antenna. One is adjusted to be resonant to say 65, and the other to 90, cycles per second. One of the radio beacon loops emits high-frequency waves carrying fluctuations of intensity at the rate of 65 cy. p. s., and the other loop similar high-frequency currents modulated at 90 cy. p. s. One of the two reeds in front of the pilot will then respond to waves from the north-south loop, and

the other to waves from the east-west loop. So long, then, as the pilot flies on the true midway course, the two reeds will maintain equal amplitudes of vibration; but if the ship deviates from the course, one reed will vibrate more and the other less.

### AIDS TO MARINE NAVIGATION

In recent years, great developments have occurred in the technic of radio aids to navigation. These consist of various international services; namely, radiocompass stations, radiobeacons, time signals, and weather warnings.

Radio compass stations are radio stations situated upon the seacoast, and equipped to measure, with satisfactory precision, the direction or compass bearing of a ship at sea, emitting radio signals for that purpose. When two or more such radiocompass stations simultaneously observe and then report the observed bearing of the vessel seeking her position, this position can be found on the chart from the intersection of the bearings. There are now more than one hundred radiocompass stations listed in different parts of the world, available for this service. The ships requesting this information have ordinarily been unable to find their correct positions, owing to continued fog or heavy weather. They usually ask for their bearing when within about 100 nautical miles of a coast

Radiobeacons are coastal radio stations equipped to emit characteristic radio signals, either at regular time intervals, or on request; so as to permit ships at sea, in their radio vicinity, to measure the bearings of these signals and thence locate themselves on the chart. There are now more than one hundred radiobeacon stations listed in different parts of the world. In order to measure on board ship, the bearing of a distant radiobeacon, it is necessary for the ship to be equipped with a radiocompass apparatus. Ships so equipped ordinarily prefer to obtain their positions from observations made on board, of the bearings of beacon stations, than by bearings obtained from radiocompass stations on shore, and reported to them by radiograms.

Time signals are broadcast, at regular advertised hours, on specified frequencies, from nearly sixty radio stations in different parts of the world. Some of these stations have a long range. It is seldom that a ship equipped with a sensitive receiving set is out of effective range of all time-signal radio stations; while it frequently happens that several can be heard from, at different hours of the day. In this way, ships no longer fear the possible errors of their chronometers.

### DEVELOPMENTS IN WAVE TRANSMISSION

Marked improvements in long-distance radio transmission have recently been effected, through increased knowledge of the science of electric waves. It is known that when the sending antenna consists of a simple vertical wire, any single radio wave emitted from this antenna has the form of an expanding hemisphere, like an invisible half soap bubble, shooting outwards in all directions, from the sending station, with the speed of light. The texture of the shell is an interweaving of electric and magnetic forces, the electric forces being disposed around the half globe, like meridian lines, shooting up from the ground towards the zenith over the antenna, and the magnetic forces being parallel expanding rings, disposed like parallels of latitude. If an observer could see such waves, and stood at a point on the ground say 30 kilometers from the sending station; then, when a single brief radio impulse was emitted, he

would expect to see a half globe rise from the antenna and radiate outwards in all directions at a speed of nearly 300,000 km. per second. In one ten-thousandth of a second, the expanding shell would strike him. Its height above the antenna, would at that instant be 30 km., and its diameter on the earth's surface 60 km. The density of the wave would be greatest at the ground surface, and the density would taper off as he cast his eyes higher up, until at the polar vertical axis, passing through the sending-mast zenith, the density would vanish, or the shell would be quite transparent. If the observer held up a vertical wire or antenna, an electric impulse or signal would be generated in this receiving wire at the moment that the wave encountered and passed beyond it. A certain small amount of electric energy will, however, have been abstracted from the rushing shell, by the receiving wire, and put into the signal, so that the shell will have been locally weakened by its contact with the receiver.

If we assume that the ground surface is perfectly conducting, from the electrical point of view; then it would be quite impervious to radio waves and none would penetrate the ground. But this is only partially true. By reason of imperfect conduction, the ground lets some of the wave go through and sink into the soil. Whatever share of the wave thus sinks down, is wasted and lost for the purposes of transmission. Besides, trees and vegetation, over the surface of the land, act like imperfect receiving wires and weaken the passing waves. The pipes and vertical metal work in city buildings, weaken the waves still more. On the sea, these obstructions are absent and the salt water is a fairly good conductor; so that the waves carry better over oceans than over land; but even if there were no losses at the surface, the advancing waves would weaken by mere expansion. When the radius of the hemispherical wave doubles, its surface will increase four fold, and the electric energy per square meter of surface will have fallen to one fourth. There is thus weakening by simple expansion, and also weakening by losses over and into the earth; but there will be no loss of wave energy in the substance of the air, provided that the air is a perfect nonconductor. Ordinary air at the earth's surface is practically nonconducting.

In 1901, Marconi announced the reception of radio signals in Nova Scotia, for the first time across the Atlantic, from a sending station in Southern England. A rough calculation then showed that, with the apparatus employed, the signals were stronger than could be reasonably accounted for after spherical expansion to a radius of some 4,000 kilometers. It seemed necessary to assume that spherical expansion had not taken place. It had already been found by English scientists that atmospheric air might conduct electricity better than ocean water, if rarified to such a low density as should exist at an elevation of about 80 kilometers above the earth's surface. The sun's rays, and particularly its ultraviolet rays, are known to ionize the air; *i.e.*, to break up its atoms into positive and negative constituents. An ionized layer should therefore exist in the upper atmosphere, capable of turning the radio waves back, like an inverted mirror. Such an ionized layer, with actual or virtual reflecting properties, is now believed to exist, and radio echoes have been obtained from it. This layer seems to descend during the day, under solar influences, and to ascend at night, to a height of perhaps more than 500 kilometers. The layer seems to improve the carrying power of the waves by

preventing their expansion upwards to a height of more than a few hundred kilometers.[1]

It is very difficult to secure direct information about the nature and properties of the atmosphere, above an elevation of say 20 kilometers, owing to the lack of access to higher levels. It now looks, however, as though it might be possible to gain much indirect information, from technical studies of radio wave transmission. These waves ascend to high levels and return to the earth. Such information may not only be of great practical value in improving the technic of international radio communication; but also of great scientific value in the investigation of solar, and meteorological phenomena. The sun is evidently the king, in those wide solitudes far above the earth; but there is evidently much to be explored in his majesty's realm, that only radio waves can reveal, when used coöperatively by observers in many different fields of enquiry.

[1] This layer is commonly called the Kennelly-Heaviside layer.—ED.

# Broadcasting in Denmark

By Emil Holm
Director, Radio Programs, Denmark

THE first public wireless transmission in Denmark was broadcast on October 29, 1922.

It came about as the result of private coöperation and was transmitted by a quondam naval station which had been placed provisionally in a shed within the precincts of the Free Port.

It was received by a special set installed in a hall at the Technological Institute in Copenhagen, and was followed by a spell-bound audience assembled there for the purpose. It was, however, as its sponsors were the first to admit, not exactly a brilliant success.

Now, only six years after, wireless broadcasting has become a state institution. Its transmissions average some nine hours daily "upon the air," emanating, as they do, partly from the special studios for orchestras, soloists and lecturers; and partly from theaters, concert halls, churches and lecture halls all over the country; and they are followed by over 230,000 duly licensed listeners, from which it may be assumed that roughly three quarters of a million of the three million inhabitants of Denmark listen in daily—the highest percentage of listeners yet exhibited by any European country.

## Difficulties

It is obvious that such rapid development has not been effected without meeting and surmounting innumerable difficulties.

The first point of all to be decided was: What was the best way to set about organizing the activities of the new art?

Private individuals—here as in other countries—were the first to take the matter up, and certainly, private initiative is of inestimable value in forwarding a new art, and especially one which can advance and develop only through experiment, and whose range and scope no one can even guess. But, on the other hand, it is difficult to prevent separate interests from embarking upon the matter in a competitive way, and that is to the advantage of nobody, besides rendering extremely problematical, the possibility of establishing that art upon a sound financial basis.

This was what happened in Denmark.

Various listener associations were formed—with or without the support of industrial interests, in the various branches of wireless. Money was collected by voluntary contribution, and broadcasting commenced.

The initial transmissions were relayed from the State Telegraph Service Station at Lyngby, first entirely gratis, and later on for a modest fee, but it soon became evident that neither studio nor technical plant was satisfactory.

A new station was therefore erected, by a number of private firms, in the center of Copenhagen (Yorck's Passage). About this time the military authorities also erected a station at Ryvang (a northeasterly suburb of the capital), and these stations became the broadcasting headquarters of competing associations.

The result, as might be expected, was chaos—a most unsatisfactory state of affairs from the point of view of the gradually increasing army of listeners.

Another great disadvantage entailed

by this arrangement was the consequent lack of financial support. It became increasingly difficult to procure really first-class talent—artists or lecturers—when all had to perform for little or no remuneration at all.

And finally the question of obtaining one—or preferably several—suitable studios became ever more insistent.

At New Year, 1924, the transmitting plant was installed in a diminutive room in a building in Købmagergade, then belonging to the telegraph authorities. This room measured 2½ by 3½ metres, and was expected to contain the administrative staff, the orchestra and solo performers, the control plant and the engineers on duty.

To continue in this way for long soon proved impossible. At the end of two months a studio was procured large enough to contain an orchestra of five or six performers, but it was not until the autumn of 1925 that a studio even relatively worthy of the name was secured.

This room contained as many as twenty-four musicians, and was equipped and arranged in accordance with the principles and knowledge of broadcasting that then obtained. About the same time it was at last acknowledged that broadcasting was an institution requiring ordered and systematic administration, and the most perfunctory of office premises and a skeleton staff were made available.

### STATE RADIOPHONY

About that time, too, the state took over, experimentally, the institution and administration of broadcasting, and in April, 1926, state radiophony became an actual fact.

By an act passed in 1926 the supreme authority was placed in the hands of the first commissioner of public works, but broadcasting as an institution was subdivided into the purely technical department, superintended by the postmaster-general and the administrative staff; everything connected with the Program Service was placed under the control of a Radio Council consisting of nine members. This Council is appointed by the chief commissioner in accordance with the wishes of the various listener associations, the press, the Union of Manufacturers and Traders, etc., and is directly responsible to him for its administrative work. The present president of the Council is Mr. C. Lerche, Chamberlain.

An annual license fee or yearly tax upon every receiving set was legally enacted. At present this fee is 10 Danish kroner.

The advantages of the new system soon became apparent. The administration assumed a firmer and more concrete form. The program director, in collaboration with the Council "Program Committee," was, at last, in a position to plan and carry out satisfactory programs with some hope of being able to execute them in a satisfactory manner, for the means necessary to do so were now forthcoming.

When this improvement was effected it was thought by optimists—rational optimists, that is—that the number of listeners might very possibly reach a total of 100,000, thus yielding a budget of one million kroner yearly.

The actual figures, however, far exceed this figure. There are, as mentioned above, at present, some 230,000 listeners in all.

In short, the new system "caught on."

During the last couple of years two new stations have been built, a small one specially for Copenhagen (in the Post and Telegraph Administrative Building), and a larger one near Kalundborg to serve the remainder of the country. These two stations were

built by a Danish firm (M. P. Pedersen & Company) and by the Western Electric Company, respectively.

Unfortunately the latter station is the subject of much contumely among listeners all over Europe in that the old wave length, 1,153 metres, was within the frequency range which, by the decisions of the Washington Conference, is barred, at present at least, for civil broadcasting. We hope, however, that some acceptable solution of this difficulty will soon be arrived at, as both stations function otherwise in a fully satisfactory manner.

### STUDIO PROBLEM

The problem of suitable studios has been solved—though not yet finally, as the advisability of erecting a special building to contain partly broadcasting premises, and partly a "spoken word" stage in conjunction with the Royal Theater is now under consideration. But in their present quarters at Axelborg in Copenhagen the present studios serve their purpose remarkably well.

First there is a large studio for orchestral items. The permanent station orchestra comprises 30 members, but may be augmented by some 60 performers when occasion demands. This studio is so arranged that by withdrawing some dividing curtains it becomes part of a large concert hall containing comfortable seating accommodation for 400 listeners. Thus, probably for the first time in Europe, a concert hall studio has been inaugurated possessing (1) plenty of room for a large orchestra, and (2) the added advantage that orchestra and soloists alike, being faced by an audience, are incited to do their utmost.

Secondly, there is a smaller studio for solo performers, small ensembles, sketches, plays, etc., and finally, a "talks" studio.

Lecture studios have also been installed all over the country, and, as already mentioned, the Royal Theater, several concert halls, and a number of churches have been fitted up with permanent relays. Microphones are often placed in other theaters, too, for it is proved beyond doubt that broadcasting, the former bugbear of all theatrical managers, is now, to a certain extent, their warmest supporter in that the broadcasting of suitable theatrical performances, *e.g.*, operas, operettas, musical comedies, etc., has been found to be an extremely useful advertisement for the theater in question.

### PROGRAMS

The program director is the author, a royal opera-singer, whose heart and soul has been in radio from the very start. In 1923, by unanimous request, he took over the management of the artistic side of the new art and, in 1926, he was officially appointed station director, *i.e.*, director of programs, by Act of Parliament. During the whole period of his leadership, and without being deterred by the ever-increasing size and scope of the programs, the director has always followed his conviction that listeners should be given the very best in art and entertainment, whether grave or gay. He has followed the principle that it is the very special requirements of broadcasting that must always be considered first in deciding whether or not a performer or artistic contribution is suitable for acceptance.

The programs now comprise musical broadcasts (which are and always must be the main feature) of considerable artistic merit, as well as entertainment of a lighter nature—from symphonies and chamber music to songs and dance music; readings of extracts from the oldest classical up to the most modern of present-day writers, dramatic works

of Shakespeare, Molière, Goethe, Ibsen (adapted for broadcasting), to the airiest of musical comedies; several "talks" daily on the arts and sciences, on social and political questions, and on every possible subject of any real human interest: divine services, news bulletins, relays from concert halls, theaters and, as far as possible, of all the more important topical events—from a political meeting to a football game—anything, in fact, which may be considered of sufficient general interest to warrant its inclusion in the program. Indeed, things have now reached such a pitch that every time something only a little out of the ordinary occurs one or another section of the public is sure to ask: "Aren't you going to broadcast that?"

# The Extent of the Development of Radio Over the World

By Lawrence D. Batson
Electrical Equipment Division, Bureau of Foreign and Domestic Commerce

THE history of radio development for the seven years during which broadcasting has been extending its influence is not the property of any one country or race. Advancement has been world-wide, even though few countries have produced original ideas upon which developments have been based.

In order that the story may be clearly understood regarding other countries it is necessary to consider what has taken place in the United States. It is in the United States that broadcasting has been developed to the greatest extent. It is in the United States that the use of receivers has become more common than in any other country. It is not surprising, therefore, that the newer equipment should originate in the United States, where the demand advances as rapidly as the course of radio history.

It is but a matter of a few weeks at most before equipment newly introduced on the American market finds both supply and demand in other countries. Radio literature is surprisingly international in its appeal, and the American publication dedicated to radio carries abroad the description and advertisement of the latest wrinkles, with immediate inquiry and demand on the part of foreign purchasers. Radio exporters early learned of this new force in radio trade, and are now usually prepared to introduce their equipment almost simultaneously in all world markets.

The universality of its history and of the current conditions affecting that history are most pronounced in the changes broadcast reception has wrought in the people, individually and collectively. In seven years the public has passed from dependence upon newspaper bulletins and extra editions tc the radio for prompt information. It has passed from the theater for the introduction of the latest music to the receiving set; from guarded sectionalism in thought and loyalty to nationalism through mutual understanding. There has just come to a close the greatest presidential campaign this country has ever witnessed. The people were informed as to the issues at stake, by non-partisan radio; never before were such agencies available to spread this information, without at some place being subject to censorship by some strongly biased hand.

International tolerance is becoming more pronounced. This is felt less in the United States, where our neighbors are fewer and where we are already on a footing of understanding, than in Europe and other parts of the world, where races of differing language, history, and ideals have thrown about themselves frontiers effectively separating them into small units.

Seven years ago, amateur and professional experiment and marine communications appeared to be the limit of radio's usefulness, in the eyes of the general public. Today, families have adopted the receiving set as a piece of furniture hardly to be displaced for anything less necessary in the home than a dining table. The number of receiving sets has grown steadily; it is

now estimated that in the United States alone there are over 8,000,000; some estimates place this number as high as 15,000,000. The lower figure, using 5 as the average number of members to each family for a multiplier, indicates that 40,000,000 people, one-third of the total population of the country, have radio reception in the home, not including their unwilling neighbors. Seven years ago these numbers equalled zero.

### MEASURING DEVELOPMENT

It is perhaps possible to gauge radio developments in different countries statistically, but the statistics vital to such calculations are not collected except in scattered cases. The few figures which are available are of such variety that no two countries could be subjected to the same formula.

The number of radio receiving sets in use, the number of sets per thousand population, the number and power of broadcasting stations, the importation of radio sets, are among the statistics which are available. This statement is made with reservations, as the accuracy of these statistics in developing a table is questionable. There is no more reliable method of determining the number of sets used abroad than of those in the United States. Even with license and registration systems, it is impossible to obtain reliable figures. The apprehension of users of unlicensed receiving sets is the most serious radio problem in many countries, and is something of a problem in all that have any sort of licensing or registration requirement. The result is that the licensing agencies' figures are but a minimum of the number of sets that have been used. Licenses are usually granted by the year; a set taken for a demonstration, if it is to be operated by the prospective purchaser, must usually be covered by a license for a full year, whether a purchase is made or not. If a separate license is required for each set, and a person tries out four or five sets before finally purchasing, the inaccuracy of the resulting licensing statistics can be readily seen, even though no accounting for illegally operated sets is made.

Statistics covering broadcasting facilities are usually more reliable, but cannot be claimed as accurate. The power of broadcasters was considered a military secret in one important country for several years after the advent of broadcasting. Stations are opened, wave lengths and power ratings are changed, operations are suspended, stations are closed and sometimes demolished, without recognition by their national governments so far as informing the public is concerned. Keeping track of such contortions in the number of stations and determining their value in radio developments is practically impossible.

Statistics in other respects are almost non-existent. There is no statistical method for measuring individual or collective purchasing power, because income statistics are not available. Legal control and regulations might be reduced to statistics, were it not for the fact that such regulations are subject to obscure interpretations and varying degrees of enforcement. License fees mean little, because of their relation or lack of relation to the purchasing power of the whole people or of that class of people who are likely to be interested in radio.

### LEGISLATION

The outstanding feature of national legislation is the dissimilarity of the codes adopted. Each country appears to have considered that all existing codes were necessarily undesirable for its particular use, and that a new system hitherto untried must be the ideal

one for its adoption. This appears to be due largely to the fact that the problems have proved exceptionally difficult ones of solution, each code as adopted showing faults it was desired to eliminate.

Radio broadcasting is subject to all of the regulations provided for other kinds of radio transmission and reception, in addition to many additional specific regulations that govern broadcasting alone. Thus broadcasting may be prohibited; it may be permitted under monopoly, held either by the Government or by one or more private concessionnaires; or it may be permitted to any number of citizens showing proper qualifications, and these qualifications may vary.

Reception may be prohibited, and this has been done in some countries in the past though such rigid limitations are disappearing. It may be necessary to secure permission to receive, or at least to deliver a proper notification to a designated Government agency that the set is installed. The untrammeled use of receiving sets is permitted in very few countries, and but one or two others add only such requirements as are outlined above.

Most countries provide that the listener shall pay some fee. These fees are another basis for differentiation in the analysis of regulations. Installation fees, annual license fees, and subscription fees are common; these may be collected by the Government or by the broadcaster, and in either case may be shared with the other agency. They vary from 5 cents to $18 per year, and may or may not be expected to pay the cost of broadcasting.

Regulations provide for the financing of broadcasting, either by inclusion or omission. The cost may be borne by the broadcaster who uses it as a goodwill adjunct to another business, or operates in radio as an avocation; it may be borne by an advertiser or advertisers through fees for direct advertisements; it may be paid by the listeners through any of the multifarious systems indicated in the preceding paragraph; or it may be provided for through some form of Government subsidy. In this matter, too, various combinations are noted.

Governments generally receive a portion of the revenues from receiving license fees. The participation of the Government in the upkeep of stations through subsidy or tax remission is rare, excepting, of course, those stations which are operated by governments. Deficits in the case of Government broadcasters are usually made up out of the national treasury.

Where regulations specifically recognize the necessity of a financial return for broadcasters, the only solutions of the problem proposed are through advertising or receiving licenses. Few countries permit advertising of any nature, two methods being recognized when this permitted. The first is to provide for a program at the station's expense, with a certain amount of advertising interspersed, the limit usually being five minutes' advertising for each hour's broadcasting; the other is to permit an advertiser to provide program material of a general nature, of entertainment or instructive value, with advertising matter broadcast before and after each number. From the listener's viewpoint, the only difference lies in the fact that the former system limits the amount of advertising.

Receiving licenses under many guises are provided for in various ways. This depends mainly upon the form of the broadcasting system. In the United Kingdom, where the Government has a broadcasting monopoly, a fee of 10 shillings is collected each year from the owner of each receiving set, with deficits and surpluses being adjusted by

withdrawals from or deposits in the general treasury. In Italy and South Africa, there is a license fee collected by the Government, and a second—subscription—fee collected by the private broadcasting monopoly. Canada and France provide for receiving licenses collected only to defray the costs of collection and issuance of licenses, the broadcasters collecting from advertising sources. Australia collects fees which are turned in part over to the principal stations in the State in which they are collected, with other broadcasters defraying expenses from proceeds from advertising broadcasts.

Practically all of the radio apparatus entering into international trade originates in the United States, United Kingdom, and Germany, which are about evenly matched for first place. In measuring the development of radio broadcast developments in any country, one of the most convenient gauges is United States export statistics.[1]

## DEVELOPMENTS IN FOREIGN COUNTRIES

Below are given the outstanding facts concerning radio development in the principal foreign countries. The number of sets for each country is taken from recent estimates and statistics made or published in that country. In nearly every case, figures given are as of some date between July 1 and December 1, 1928; this includes all of the countries of more than exceptionally minor importance. Lack of space forbids extended remarks, but it is considered that the data given are sufficient to provide a picture of conditions in each country.

[1] Tables showing exports by countries for the calendar years 1919 to 1928 are published as a mimeographed circular by Electrical Equipment Division, Bureau of Foreign and Domestic Commerce.

### NORTH AMERICA

*Canada* has 230,000 receiving sets, 39.13 per thousand population, and 60 broadcasting stations divided among 38 cities. Radio is controlled by the Department of Marine and Fisheries. There are no exceptional restrictions on broadcasting, the only limitation being that broadcasters must be citizens of the British Empire. Receiving sets are licensed at the rate of $1 per annum, the fine for operating without a license being $50. There are no other restrictions on receiving, nor are there any on importing, manufacturing, or merchandising.

*Costa Rica* has 250 sets, .49 per thousand population. Costa Rica also has a broadcasting station, situated at San Jose. No regulations have as yet been reported. There are 250 sets in *Guatemala*, .12 per thousand population, and a broadcasting station just opened at Guatemala City. The only regulations of interest are the requirement of a $5 installation fee, and one that merchandisers must notify the Government of each sale of radio apparatus. *Honduras*, which has adopted no regulations, has 24 sets, .03 per thousand population. In *Nicaragua* there are 20 sets, likewise .03 per thousand population, and receiving licenses are required. The cost of these licenses has not been reported. The *Republic of Panama* has 800 sets, 1.81 per thousand population. Receiving sets are inspected when installed, a fee of $2.50 being charged for this. There is no annual charge. Broadcasting is prohibited through the treaty between the United States and Panama providing for the government, defense, and operation of the Panama Canal. *Salvador* has 250 sets, .16 per thousand population. In this country broadcasting is a monopoly of the Government. Receiving is permitted only to Salva-

doreans; foreigners will be issued permits if they renounce their right to present claims through diplomatic channels. The following rates are fixed by decree: Application for permit, 5 colons ($2.50); installation of receiving set, if made by Government, 30 colons ($15); monthly payment, 3 colons ($1.50). The use of regenerative sets is prohibited. Importing, manufacturing, and merchandising are Government monopolies, but the granting of concessions is provided for.

*Mexico* has 50,000 sets, 3.49 per thousand population. Broadcasting is administered through the Department of Communications and Public Works. Permits to broadcast are required, and the Government reserves the right of censorship. Broadcasting is supported by the owners and operators of broadcasting stations. There is no monopoly, and many of the stations are operated by Government departments, though the majority are privately owned. Licenses are required for receiving sets. Mexico has 19 broadcasting stations in 10 cities. Eight of these stations are in Mexico City.

*Cuba* reports 25,000 sets, 7.31 per thousand population. There are 40 broadcasters and amateurs occasionally broadcasting, in 16 cities; 17 of them are in Habana. Three broadcasting stations licensed as such are situated in Habana. Permits are required for regular broadcasting. Receiving is permitted without restriction.

The *Dominican Republic* has 550 sets, .61 per thousand population. No regulations for this country have been reported.

*Haiti*, with 750 sets, 3.26 per thousand population, has one broadcasting station, at Port au Prince. Broadcasting is a Government monopoly, but there are no restrictions on the use of receiving sets.

## SOUTH AMERICA

*Argentina* has 525,000 sets, 52.05 per thousand population, standing high among the leading countries in this respect. There are 22 broadcasting stations in 7 cities, 14 being in Buenos Aires. Radio is controlled by the Government through the Chief of Naval Communications. Broadcasting is permitted freely, permits costing only a one-peso stamp tax on the application. Receiving sets may be installed by any one, the only requirement being that the Chief of Naval Communications be advised of the installation.

*Bolivia*, of all the countries of South America the one most cut off from outside influences, has some 25 receiving sets, .01 per thousand population. There are two small broadcasting stations in La Paz. Radio broadcasting is under the control of the Ministry of Communications, Director General of Telegraphs. Licenses are granted without any monopoly, only for the purpose of broadcasting gratuitous entertainment. Five minutes each hour may be employed in the broadcasting of advertising matter. Stations are licensed to operate certain hours daily. Receiving licenses will be granted to all applicants, an initial fee of 5 bolivianos ($1.70) and an annual license fee of 36 bolivianos ($3.85) being charged.

*Brazil* has 250,000 sets, 6.43 per thousand population. There are 15 broadcasting stations divided among 10 cities. Radio is administered by the Department of Public Works and Transportation, Department of Marine, and the Department of War. Concessions for the establishment of broadcasting stations are required. There is no broadcasting monopoly. Receiving is permitted, registration being required. The registration fee is 20 milreis, there being no annual charge.

Sets are subject to Government inspection.

In *Chile* there are some 30,000 sets, 7.62 per thousand population, and 8 broadcasting stations in 7 cities. Radio is controlled by the Ministry of Marine. The only regulations affecting broadcasting are those requiring registration and the ordinary precautions for the safety of the State and protection of public morals. Registration of receiving sets, without fee, is required.

*Colombia* has but 22 receiving sets, less than .005 per thousand population. There are no broadcasting regulations. Climatic conditions are responsible, as reception is impossible during most of the year, and never very satisfactory.

*Ecuador* has 150 sets, .10 per thousand population. Broadcasting has been declared a monopoly, but until there is some immediate possibility of a station being established, restrictions have been held in abeyance. It is the apparent intention of the Government to provide for a system of receiving licenses when this is done.

*Paraguay* has 150 sets, .18 per thousand population, and one broadcasting station at Asuncion. No regulations have been adopted.

*Peru*, with 18,000 sets, 3.27 per thousand population, has but one broadcasting station, at Lima. A broadcasting monopoly was declared, under which an agreement was entered into with the British Marconi Company, which then operated the postal and telegraph systems of Peru. This agreement provided that only the concessionnaire could legally broadcast, or import, manufacture or sell radio apparatus. It was further provided that a fixed percentage of the radio materials imported should be of English manufacture. Under this latter clause, importation settled into the proportion of the fixed percentage of British goods and the remainder of American. The American proving much the more popular, it soon developed that the company was forced to purchase extensive supplies of British goods of which it could not dispose, and at the same time was restricted in its purchase of American goods for which there was the greater demand. Under these circumstances most of the profits were eaten up by frozen merchandise. Another difficulty arose in the opposition of business men throughout Peru, who had expected to obtain merchandising licenses from the Marconi Company, but that company decided to establish its own branches throughout the country for retail sales. These conditions combined to bring about the cancellation of the agreement, for which one was substituted, providing that the Marconi Company should operate the broadcasting station for the account of the Government, while merchandising was provided for otherwise.

*Uruguay* has 17,000 sets, 10.01 per thousand population. There are 14 broadcasting stations in 2 cities, 12 of them being in Montevideo. Radio is under the control of the Division of Radio Communications Service of the Uruguayan Government. There are no exceptional restrictions on broadcasting, while receiving is freely permitted. Regulations in effect are similar to those applied in the United States before the rendering of the court decision under which it was found that the legislation was inadequate.

*Venezuela* has 2,000 sets, .66 per thousand population. There is one broadcasting station, at Caracas. Radio is regulated by the Ministry of the Interior. A monopoly on broadcasting, importing, manufacture, and merchandising has been granted to a Venezuelan concessionnaire. Receiving licenses costing $5 per month are required.

## EUROPE

*Austria* has 325,000 sets, 49.79 per thousand population. There are 7 broadcasting stations in 5 cities. A broadcasting monopoly is held by the Oesterreichischer Radioverkehrs Aktiengesellschaft, a broadcasting corporation. This company is controlled by the State, which owns 60 per cent of its stock. Its activities are supported by the proceeds from license fees, the amount depending upon the use to which the set is to be put and the income of the licensee. Control over all activities is maintained through a system of licenses which include not only broadcasting and receiving, but importing, manufacturing, and merchandising as well. In addition to the license, importers must secure a special permit covering each shipment. Records of all sales must be kept; these are subject to inspection at any time. Merchants are held liable for sales made to persons not licensed to possess radio apparatus. In addition to duty, there is a 5.5 per cent turnover tax which is collected by the customs authorities.

*Belgium and Luxemburg* have 62,500 sets, 7.94 per thousand population. There are 5 stations in 4 cities in Belgium, and one station in Luxemburg City. Receiving licenses costing 240 francs ($6.62) per year are required. The use of regenerative sets is prohibited. A sales tax of 45 francs ($2.16) per tube socket is collected, but there are no exceptional restrictions on importing, merchandising, or manufacturing.

*Bulgaria* has 50 sets, .01 per thousand population. All means of communications, such as railways, telephones, telegraphs, and wireless stations are monopolies of the Government, which will not permit the private construction of broadcasting stations, and until recently, of receivers. Receiving sets may now be used by a very restricted class.

*Czechoslovakia* has 250,000 sets, 18.56 per thousand population. It also has 4 broadcasting stations in 3 cities. Radio control is vested in the Ministry of Posts and Telegraphs, which controls the concessionnaire holding the broadcasting monopoly. Broadcasting is supported by subscriptions collected from receiving set owners. This subscription is 10 crowns ($0.30) per month. Licenses are granted to Czechoslovak citizens and to the nationals of other countries which grant the same or greater privileges to Czechoslovak citizens. Importing is prohibited except under license, which is granted for a fee equalling 5 per cent of the value of the shipment. Duty is collected in addition. The provision referring to reciprocal granting of licenses is clearly directed at Germany, where certain nationals are prohibited the right to receiving licenses, but is equally effective in the case of the nationals of countries which prohibit the use of radio receiving sets.

*Denmark* has 215,000 receiving sets, 62.88 per thousand population. There are 5 broadcasting stations in 3 cities. Broadcasting is governed by the State Radio Council, and is supported by the proceeds from license fees, and all of the present broadcasting stations are Government-owned. No restrictions, except for the license requirements, have been imposed upon the owners of receiving sets.

*France* is reported to have 1,250,000 sets, rating 30.78 per thousand population. It also has 28 broadcasting stations in 21 cities. Broadcasting is permitted only by French citizens. Permits are sparingly granted. There has been considerable recent agitation for a national monopoly, and some legislative progress has been made in that

direction, but it is apparent that final decisions have not yet been made. The cost of operating stations is borne by the broadcasters. The Ministry of Posts, Telegraphs, and Telephones supervises the enforcement of regulations. Receiving licenses costing 1 franc per year are required in the case of French citizens. Regulations stipulate that foreigners shall pay 10 francs per year, but this requirement is often passed in particular cases. A luxury tax of 12 per cent on sets costing more than 500 francs and on parts costing more than 50 francs is now collected.

*Germany* has 2,350,000 sets, 37.69 per thousand population, and 30 broadcasting stations in 26 cities. Radio broadcasting is under the control of the postal authorities, who own the equipment of all stations. Broadcasting is done by corporations, each of which has a monopoly within defined portions of the country. These corporations are reimbursed from the proceeds from license fees collected within their respective territories. Receiving licenses are freely granted to all applicants except Russians, Poles, and Slavs. A fee of 24 marks ($5.60) per year is exacted, for which a person is entitled to operate one receiving set; regardless of the number of sets which he may have in his possession, additional licenses not being required unless more than one set is to be operated at one time.

*Hungary* has 13.54 sets per thousand population, the number of sets being 113,307. There are three broadcasting stations, all in Budapest. Radio is under the control of the Postal administration, which holds a monopoly on broadcasting. Stations are supported by proceeds from license fees. Licenses for receiving sets are issued to all applicants, and costs 30,000 crowns of the old currency, or 2.40 pengoes, equal to 45 cents per year, when the set is to be used only for amateur receiving. Higher fees are charged for sets to be used for business purposes. Government inspection and supervision of all sets is required. Manufacturing, importing and merchandising of radio apparatus are subject to permits issued by the Ministry of Commerce, and are under the supervision of the postal authorities.

In the *Irish Free State* there are 30,000 sets, 10.09 per thousand population. Two broadcasting stations are operating in Dublin and Cork. Broadcasting is a Government monopoly, and is supported by the proceeds from receiving licenses. Receiving regulations are very moderate, aside from the requirement of licenses, which cost 10 shillings ($2.43) per year.

*Italy* has 250,000 receiving sets, 6.17 per thousand population. There are 5 broadcasting stations in 4 cities. Broadcasting is a monopoly under the control of the Ministry of Communications. The monopoly is held by the Unione Radiofonica Italiana, a corporation organized for that purpose. Licenses costing 3 lire (12 cents) per year are required for the operation of receiving sets, the proceeds accruing to the national treasury. Subscriptions to broadcasting service are compulsory, the funds received being used for the purpose of supporting broadcasting stations and providing programs. Amateurs are required to pay 96 lire ($3.75) per annum for this service. Receivers employed for commercial purposes are assessed at varying rates, sometimes as high as 3,000 lire ($120) per annum. No set may be installed unless approved by the Ministry of Communications. Samples of manufactured sets may be deposited as a check against adherence to types in lieu of individual inspection of sets, which is otherwise required. Sales taxes are also assessed.

There are 150,000 sets in the *Netherlands*, 20.23 per thousand population. Six broadcasting stations are divided among 5 scattered cities. The postal authorities must be notified of the installation of a receiving set.

*Norway* has 70,000 sets, 26.42 per thousand population. There are 8 broadcasting stations in 7 cities. The control of broadcasting is vested in the telegraph authorities. The use of radio by amateurs is prohibited, and all of the stations at present operating are owned by the Government, though no monopoly has been declared. A license fee of 20 crowns ($5.36) per year is collected from receiving set owners, the proceeds being used to defray broadcasting expenses. A special Government authorization is required to import radio apparatus.

*Portugal* has 2,500 sets, .44 per thousand population. There are two broadcasting stations in Lisbon. No restrictions on either broadcasting or receiving have been reported.

*Rumania*, with 17,000 sets, has .98 receiving sets per thousand population. Broadcasting is supported by subscriptions, varying from 200 to 250 lei ($1 to $1.25), depending upon the size of the set. A special permit by the Home Office is required of foreigners. Regenerative sets are prohibited. The initial regulations having been issued late in 1925, there has as yet been little development of the market.

*Spain* has 75,000 sets, 3.45 per thousand population, and 14 broadcasting stations in 11 cities. Regulations in regard to broadcasting are liberal. Receiving licenses are liberal, and foreigners must obtain special permits. There are no restrictions on importing, merchandising, and manufacturing, except a requirement that salesman be licensed.

There are 365,000 sets in *Sweden*, 60.26 per thousand population. There are also 31 broadcasting stations, in 31 cities. Radio is under the control of the Telegraph Administration. A broadcasting-monopoly has been granted to a corporation known as "Radiotjanst," Government controlled, but transmitting licenses are freely issued to amateurs. The monopoly has provided facilities for the rebroadcasting of programs of its stations by amateur clubs in various cities and towns, many of them also broadcasting local programs. Permits to install receiving sets are issued at the rate of 40 crowns ($10.72), while receiving licenses cost 10 crowns ($2.68) per year.

*Switzerland* has 75,000 sets, 10.05 per thousand population. There are 6 stations in 5 cities. Radio is under the administration of the central telegraph office of the Postal Administration. Broadcasting by other than Swiss citizens is prohibited. Stations are supported by the proceeds from license fees after the Government has deducted 25 per cent for its own uses. Permits to operate receiving sets are granted to Swiss citizens only. A preliminary Government inspection of the installation, costing 3 francs ($0.60) is required, the annual assessment being 12 francs ($2.32).

The *United Kingdom* has 2,500,000 receiving sets, 56.48 per thousand population, and 21 broadcasting stations in 21 cities. Radio is controlled by the Post Office Department. Broadcasting is a monopoly vested in a subsidiary organization of the Post Office. To defray the costs of broadcasting, receiving licenses costing 10 shillings ($2.43) per year are required. No further restrictions are imposed under radio legislation, but recent decisions by British courts on patent matters have so involved not only British manufacturers but those of other countries exporting to the Kingdom that the

merchandising end of radio has come under many new restrictions.

*Yugoslavia and Albania* have a combined total of about 2,500 sets. The only broadcasting station is at Zagreb, Yugoslavia. In Yugoslavia, permits are required for broadcasting. Nothing but music may be broadcast. Private persons may not install broadcasting stations or other sending sets. The permission of the Ministry of Posts and Telegraphs is required before a receiving set may be installed. Theoretically, foreigners may not obtain this permission, although exceptions are made. In applying for a permit to install a receiving set the individual must describe his set in detail and indicate the room in which it may be found. Permits may be revoked at any time. No regulations for Albania have been reported.

### EURASIA

*Russia* has 200,000 sets, 1.37 per thousand population. There are 45 broadcasters in 41 cities, scattered throughout both European and Asiatic Russia. No regulations have been reported, but the following are apparent: there is no broadcasting monopoly, though practically all of the broadcasting stations are owned by trade and local governments; no receiving licenses are collected; manufacture, importation, and merchandising are a Government monopoly, with importation only where domestic industries are incapable of supplying the demand.

*Turkey* has 175 sets, .02 per thousand population, and one broadcasting station, at Osmanieh, near Constantinople. Radio is under the control of the Administration of Posts, Telegraphs, and Telephones. Broadcasting is a monopoly. Receiving is permitted under license, but the licenses are costly and have been made difficult to get. Sets must be available for Government inspection at all times, and are subject to confiscation without warning, explanation, or indemnity.

### ASIA

*China* has 15,000 sets, .04 per thousand population, and 7 broadcasting stations in 4 cities. Recent political developments have resulted in the ultimate granting of the right to use radio, to the public. So far as is known, complete regulations have not been issued, but the establishment of broadcasting stations and other acts encouraging the use of radio give promise of regulations under which radio should gain a high rate of development, as compared with other national activities.

*Japan* has 550,000 sets, 7.03 per thousand population. There are 7 broadcasting stations in 7 cities. Radio broadcasting is controlled by the Bureau of Communications, broadcasting permits being issued only to Japanese citizens. Each station licensed has a partial monopoly within certain bounds. Stations are divided into two groups, according to their power. Low powered stations have monopolies in certain small areas, while high-powered stations have monopolies in larger areas, which may include several of the areas assigned to local stations.

In theory, this would restrict the number of stations which might be received at any one point to one high- and one low-powered station. Broadcasting is supported from receiving license fees. Receiving sets may be operated upon payment of the license fee of 2 yen per annum and a subscription fee of 1½ yen per month. Permits to install are required, and only sets approved by the Bureau of Communications may be used. Manufactureres and importers may deposit sample sets, the approval of which will serve for additional sets of the same

type so long as none of the specifications are changed. Wave lengths of from 150 to 400 meters may be used, but none other. Recently the existing broadcasters agreed to form a central corporation which took over the stations and their business, the individual companies operating them under the control of the corporation. This system seems to have proved more satisfactory and economical than that formerly adopted.

*Australia* has 290,000 sets, 52.45 per thousand population, and 26 broadcasting stations in 12 cities. Broadcasting is under the control of the Postmaster General. Stations are divided into two categories, those of high and those of low power. There is no restriction as to the number or location of low-powered stations, but high power is permitted to but one station in each of the States except Victoria and New South Wales, each of which may have two. These stations are more strictly administered than those of low power, and participate in the proceeds from receiving license fees. There has been some movement recently toward the consolidation of the companies operating the high-powered stations, and in some cases combination of two or three have been reported. Receiving licenses are required. The cost of these licenses is determined by the distance of the set from the high-powered station for that State, a system of zones determining the rate. The fees range from 22½ shillings ($5.36) to 30 shillings ($7.30) per year, on sets for private use. Merchandising licenses are also required.

*New Zealand* has 55,000 sets, 39.09 per thousand population. There are 5 broadcasting stations in 5 cities. Broadcasting is closely supervised by the Government. While a monopoly has been declared, other stations may be licensed. The conditions governing this are not known, but probably are due to a provision permitting independent broadcasting stations to be installed in cities not provided for by the concessionnaires. Receiving licenses are required, costing 30 shillings per year. Regenerative sets are prohibited.

### AFRICA

*British Africa* has 130,310 sets, of which 130,000 are in the Union of South Africa, giving a rate of 18.76 per thousand population. The Union has 4 stations in 4 cities. The Postmaster General has supervision over radio matters. Broadcasting is a regional monopoly, each station being licensed to operate exclusively within a certain territory for a period of five years. Receiving set owners are required to obtain licenses and pay subscription fees to the broadcasting companies. The licenses cost 5 shillings per year, while the subscription vary from 6 shillings 6 pence to 35 shillings, depending upon the distance from the broadcasting stations. Higher scales are in effect for sets to be used for commercial purposes.

*Egypt* has 4,000 sets, .20 per thousand population, with one broadcasting station. Radio is administered by the Ministry of Communications. The complete regulations have not yet been issued, but it is understood that receiving licenses are to be required. Receiving has been permitted in the past but broadcasting was prohibited, though a violation of the prohibition was permitted to continue without serious attempt to apprehend the broadcaster. This has now continued over two years.

*Ethiopia* has but two sets, less than .005 per thousand population. Both broadcasting and receiving are prohibited; both the sets in use are in the possession of high officials.

# The Amateur in Radio

By Hiram Percy Maxim
President, American Radio Relay League, Inc.

MANY people seem to have the opinion that the radio amateur is a development of the last four or five years. Nothing could be further from the truth. The amateur has been an integral part of the radio picture since the very first days of "wireless"; it is a matter of record that at least one American amateur constructed a receiving set and attempted to receive the letter "s" at the same time that Marconi was making his epochal transatlantic attempt. From that time on an increasingly greater number of amateur stations was erected. Ten years later there were more amateur installations in the country than government and commercial combined.

It was about the year 1913 that amateurs awoke to the fact that there were a lot of them scattered over the country. The thing that woke them up was the Federal radio law of August 13, 1912. This law provided a call book that contained the names of all the amateurs who had passed the necessary tests to secure transmitting licenses. The astounding number listed in this book was a revelation, for it showed that instead of a few isolated individual experimenters, there were several thousand highly enthusiastic amateurs in the United States.

## Radio Clubs

With this realization, a large number of radio clubs came into existence. The value of these clubs in the early days of amateur radio—or amateur wireless, as it was then called—was very great, for there were at that time practically no books that adequately handled the subject. By providing a meeting place where members could gather and exchange ideas and practical information, the early club did much to further the art.

The organization of the clubs was an organization having the characteristics of young men. The methods were positive and direct. I have attended a great many of these radio club meetings, and I can truthfully say that I have never attended a meeting of any of my engineering societies which can compare in efficiency and interest with those radio club meetings of those young men.

It was in the Radio Club of Hartford that the relay idea which finally became the American Radio Relay League first took form.

I remember the evening very well. One young man had electrified the meeting by saying that he had established communication with the neighboring town of Windsor Locks. If Hartford could reach Windsor Locks, why could not Windsor Locks reach Springfield, Massachusetts, and if this could be done, why would it not be posssible for an amateur in Hartford to send a message by relay to Springfield, and possibly receive the answer back inside of an hour? The idea fired the imagination of every person in the room, and aroused a determination to go home and sit up the rest of the night improving and perfecting the efficiency of his apparatus so that the next night he might be the first one to start a message to Springfield. It was a great conception in those early days. The intensity of purpose which was built up was destined to exert the most powerful influence in the whole art of radio

communication. I do not hesitate to say that many of the great advances that have been made in radio during the last ten years have come from this inspiration of the amateurs.

It was but a logical thing to take the next mental step, and that was to go beyond Springfield. Why not continue the scheme to Pittsfield, Massachusetts, and even to Albany? And why might we not expect the Albany fellows to work it out with the fellows of Utica? And what would stop them from getting all the way to Buffalo? And then a wonderful conception came into the minds of these young men. Why not apply the relay idea to the entire United States?

### AMERICAN RADIO RELAY LEAGUE

They went ahead with this idea, and in 1914 the American Radio Relay League came into being as the national organization of all the radio clubs of the United States that stood for good organization, good government and good radio. A board of directors was organized, and shortly afterward publication was started of a magazine which should be the mouthpiece of organized amateur radio and the clearing house of the ideas and experiments of the members. This magazine was called "QST."

In order to further the handling of messages between members, a traffic system was devised, and the regular handling of traffic began. By the summer of 1917, messages had been relayed across the continent, and it was no unusual thing for an amateur to communicate directly between New York and Chicago, and to points in the far Southwest.

The war with the consequent closing down of all amateur stations, brought all development to an abrupt halt. The Army and Navy suddenly found themselves in need of hundreds of radio operators. To train this number of men from raw recruits meant months of work and study. Time was priceless. And so an appeal was made to the amateurs, through the League, and almost overnight the Army and Navy found themselves supplied with thousands of experienced young men who not only knew how to operate, but were entirely familiar with the principles of the complex apparatus in use. The War Record of these young men is one of the shining pages in the League's history.

Following the cessation of hostilities in 1919, the League again started operation. The military training received by so many of its members began to show at once in better organization, better coöperation, and greater loyalty. The relay traffic lines grew and grew, and the volume of traffic went to figures that far exceeded those of previous years. Long-distance records over the country were hung up nightly. A transcontinental test was arranged, and such was the organization that when the night of the test arrived, absolute quiet prevailed from coast to coast, so that there might be no interference. The message was started from the writer's own station, bound for Los Angeles, and the answer was returned in just six and one-half minutes. This was progress!

### OUTSTANDING EXAMPLES OF AMATEUR ENDEAVOR

By this time, operation on 200 meters was proving so successful in this country that it became a matter of speculation whether it would be possible for the amateur, with his low powers, to transmit across the ocean to Europe. So the League sent one of its members to Scotland with the finest receiving equipment available, and in 1921 American amateur signals in great numbers were heard on 200 meters in Europe!

American amateurs now knew that their 200-meter sets were capable of

being heard in Europe, and for a year they tried to effect *two-way* communication with their European co-workers, but all efforts failed. Time and again tests were made with English or French stations, but the signals were erratic in their behavior, and although American signals were heard abroad, and the foreign signals were recorded here, the much desired two-way communication could not be attained.

Gradually, the amateur realized that 200 meters was not going to turn the trick. And so, early in 1923, a group of amateurs started some tests whose results have been far-reaching. These tests were to find out what could be done with the entirely neglected waves near 100 meters, and they had not progressed very far before it became apparent that in this new region lay the key to the ultra-long distance communication problem, for the signals transmitted on 100 meters were received many times louder than simultaneous signals on 200.

Quick to adapt himself to the new conditions, the amateur began to construct apparatus to operate on the lower waves, and to collect data on set and tube operation at those wave lengths. In the fall of 1923, a special test was arranged between an American station and a French station on 100 meters, and on the night of the test the two stations, for the first time in amateur history, talked with each other across the Altantic! The theories regarding the short waves were proved, for each station reported the signals of the other as being received with remarkable strength!

The development of the short waves is another of the outstanding examples of amateur endeavor. The success of the transatlantic test lent impetus to the short-wave movement, and by the summer of 1924 most of the amateurs of the country were operating not only on 100 meters, but still lower on 80, and 40, and even 20 meters. It was during these experiments that John Reinartz, a prominent amateur, made the discovery that certain short-wave signals were actually stronger in daylight than at night over given distances. Daylight communication across the United States on low power became a fact, where ten years before night communication over the same distance was regarded as a wild dream!

By the fall of 1924 the use of short waves had become universal for all long-distance work, and the American amateur began to extend his range daily. European communication had now become matter-of-fact; the Pacific was conquered, and regular communication established with Australia and New Zealand; South America was worked with the greatest ease; and finally remote South Africa was reached, and reached again and again.

### SUCCESSFUL RESULTS

Today, the amateur can truthfully say that there is no earthly distance over which it is not possible for him to communicate.

Aside from his scientific attainments, the amateur has to his credit an enviable record of public service. When Commander MacMillan was organizing his Arctic Expedition in 1923, he came to the League for radio equipment, and a League member went North on the *Bowdoin* as operator. For the first time in history, regular communication with civilization was maintained. When the next expedition was organized in 1925, the assistance of the amateur was again asked, and Reinartz went North with MacMillan carrying the latest developments in short-wave transmitters and receivers with him. Again, through the assistance of League stations in the States, regular communication was maintained.

During this same year, too, the Navy

Department requested that the League grant leave of absence to its Traffic Manager, F. H. Schnell, in order that he might take charge of short-wave experiments to be conducted on the cruise of the battle fleet to Australia. The success of the small short-wave set that Lieutenant Schnell operated was phenomenal, and the results—far eclipsing anything that the high-power long-wave sets of the fleet could accomplish—created a profound interest in official circles.

When the Wilkins Arctic Expedition was organized in 1926, the amateur was again called on, and two League members went North with the planes carrying special short-wave equipment. Again, communication was maintained satisfactorily with the aid of other League stations in the States. The Byrd Arctic Expedition, also operating on short waves, handled the bulk of its traffic through amateur stations of the League, with 100 per cent success. The Amazon Expedition of Dr. Hamilton Rice, after vainly trying to maintain successful communication with long-wave commercial stations, went to short waves, and for months relied upon amateur contact in the States for ordering supplies, sending in reports, etc.

During 1928 a total of nine expeditions were depending upon amateur contact for communication with this country; most of them had amateurs as operators, and many of them had apparatus constructed by amateurs.

The Byrd Antarctic Expedition is carrying four radio operators, of whom three are amateurs, and amateur stations in this country are furnishing much of the communication. Amateurs are also holding regular schedules with the Wilkins Antarctic Expedition.

Since 1919, amateur radio has been the principal, and in many cases the only means of outside communication in more than sixteen storm and flood emergencies in this country. The most noteworthy were the Florida hurricane of 1926, the Mississippi and New England floods of 1927, and the California dam break and second Florida hurricane in 1928. In all of these amateur radio played a major rôle in the rescue work, and amateurs earned nation-wide commendation for their resourcefulness in effecting communciation where all other means failed.

Nor is amateur activity confined to the United States. In 1925, at Paris, occurred an event of the utmost significance, when the amateurs of thirty different nations sat down together and formed the International Amateur Radio Union, an organization whose aims are the furtherance of international amateur radio and the securing of legislation favorable to the amateur in all the nations of the world.

## FUTURE DEVELOPMENT

What of the future?

It is a difficult question to answer. In the line of scientific development, it would appear that the next immediate step is a further investigation of the waves on the order of ten and five meters. Beyond this point, however, it is impossible to predict with any degree of assurance.

To me, however, amateur radio has a more important destiny to fulfill than mere scientific attainment, and that destiny is the furtherance of world peace. War is founded on hate, and hate, in turn, on ignorance. Peace is the result of understanding, and with hundreds of citizens of every country of the world conversing nightly with each other through the medium of privately-owned and operated radio transmitters and receivers, there will come about an international understanding and fellowship the like of which the world has never before seen.

# Federal Radio Legislation

By Frederic P. Lee
Legislative Counsel, United States Senate

FEDERAL radio legislation had its beginning in Congressional attempts to further safety at sea. The Wireless Ship Act of June 24, 1910,[1] applied to any vessel of the United States or any vessel under a foreign flag navigating the ocean or the Great Lakes and licensed to carry or carrying fifty or more persons, including passengers and crew. Under the Act it was made unlawful for the vessel to leave any port of the United States unless equipped with an efficient apparatus for radio communication capable of transmitting and receiving messages over a distance of at least 100 miles. The vessel was further required to exchange, so far as the master of the vessel determined it to be physically possible, messages with shore or ship stations using different systems of radio communication.

The administration of the Wireless Ship Act was placed under the Secretary of the then existing Department of Commerce and Labor, that department (and subsequently the Department of Commerce) having charge of the execution of the marine navigation laws. The Act has served as a precedent for continuing in the Department of Commerce the administration of all laws relating to radio communication. The Act has never been expressly repealed though the greater part of its provisions is substantially reproduced in the Radio Act of 1927.

## Authority of Interstate Commerce Commission

A few days prior to the passage of the Wireless Ship Act, Congress, in the course of amending the Interstate Commerce Act, vested the Interstate Commerce Commission with authority over "telegraph, telephone, and cable companies (whether wire or wireless) engaged in sending messages" in interstate or foreign commerce.[2] The principal regulatory authority given the Commission with respect to such companies was in the administration of the requirement that all charges for services rendered in the transmission of messages should be just and reasonable. This requirement has been continued in force until the present day,[3] and is not interfered with by the Radio Act of 1927. The Interstate Commerce Commission has, however, taken almost no action under the authority granted it. The Commission's duties with regard to the railroads are so extensive as to leave it few resources for full consideration of the communication problems. The existence of this situation has perhaps led to the proposals in Congress to create one agency combining the authority now vested in the Interstate Commerce Commission, the Radio Commission, and the Department of Commerce with regard to communication by wire or wireless.[4]

## Radio Communication Act of 1912

With a desire to make further provision for safety at sea and to provide legislation necessary for carrying out

[1] 36 Stat. 629; amended 37 Stat. 199.

[2] Act of June 18, 1910, 36 Stat. 539, 544–5.

[3] See Transportation Act, 1920, 41 Stat. 474.

[4] See, for instance, the bill introduced by Senator Couzens of Michigan on January 4, 1928, S. 2041, 70th Congress, 1st Session, and the bill introduced by Senator Watson of Indiana on December 22, 1928, s. 5104, 70th Congress, 2nd session.

the Berlin Radiotelegraph Convention of 1906, to the ratification of which the Senate had consented a few months previously, Congress in August, 1912, adopted the first general legislation for the regulation of radio communication, the Radio Communication Act of 1912.[5] Of prime importance in forcing the enactment of the present Congressional statute for the governance of radio communication, was the rather ambiguous licensing provision for transmission stations in the 1912 Act.[6] The question soon arose as to whether the Secretary of Commerce had discretion to deny any applicant a license or whether the Secretary was subject to a mandatory duty of granting a license to each applicant. The Congressional reports upon the legislation would seem to indicate rather clearly the desire of Congress to afford no discretion to the Secretary of Commerce[7] and the Attorney General held to this view.[8] Shortly after the war the question arose in the courts. The Secretary of Commerce denied the Intercity Radio Company of New York a license on the ground that he was unable to ascertain a wave length for the company that would not interfere with Government and private stations. In a case during the consequent litigation the Court of Appeals of the District of Columbia followed the opinion expressed by the Attorney General and held that the duty of the Secretary of Commerce to issue a license was purely ministerial.[9] The court recognized, however, that while the Secretary of Commerce had no discretionary authority to deny the license, he had a discretion in the selection of the wave length within the limitations prescribed by the statute, such selection to be made in such manner as to result in the least possible interference.

Broadcasting was, of course, unknown at the time of the enactment of the Radio Communication Act of 1912. It was not contemplated by Congress. Nevertheless, the language used in the Act was broad enough to cover even noncommercial broadcasting, in that the Act required a license for the transmission of radiograms, the effect of which extended beyond the jurisdiction of the State in which sent forth, or of radiograms which would interfere with the receipt of messages or signals from beyond the jurisdiction of such State.

[5] 37 Stat. 302.

[6] Congress provided that no person could operate, except in accordance with a license granted by the Secretary of Commerce upon application therefor, any apparatus for radio communication (a) "as a means of commercial intercourse" in interstate or foreign commerce, or (b) "upon any vessel of the United States engaged in" such commerce, or (c) "for the transmission of radiograms or signals, the effect of which extends beyond the jurisdiction of the State or Territory in which the same are made, or where interference would be caused thereby with the receipt of messages or signals from beyond the jurisdiction of the said State or Territory." The license was required to state the wave length or lengths authorized for use by the station for the prevention of interference and the hours for which the station was licensed for work. Furthermore, the Act specified that the license was subject to certain regulatory provisions contained in the Act, among which were provisions that "every station shall be required to designate a certain definite wave length as the normal sending and receiving wave length of the station . . . in addition to the normal sending wave length all stations . . . may use other sending wave lengths: *Provided*, That they do not exceed 600 meters or that they do exceed 1,600 meters . . . such private or commercial shore stations as do interfere with the reception of signals by the naval and military stations concerned shall not use their transmitters during the first 15 minutes of each hour . . . in all circumstances, except in case of signals or radiograms relating to vessels in distress, all stations shall use the minimum amount of energy necessary to carry out any communication desired."

[7] Senate Report 698, 62d Congress, 2d Session; House Report 582, 62d Congress, 2d Session.

[8] 29 Op. Atty. Gen. 579, November 22, 1912.

[9] *Hoover* v. *Intercity Radio Co.* (1923), 286 Fed. 1003, dismissed as moot (1924), 266 U. S. 636.

Furthermore, the Senate Committee in its report clearly contemplated not only the regulation of radiotelegraphy, but also the regulation of radiotelephony of which broadcasting is but one phase. Senator Bourne, Chairman of the Senate Committee on Commerce, in his report to the Senate upon the Radio Communication Act of 1912, said:

> The term "radio communication," instead of "radio telegraphy," is used throughout the bill so that its provisions will cover the possibility of the commercial development of radiotelephony. Experiments have been made here and abroad for some years in carrying the human voice on Hertzian waves, but with only limited and occasional results. Radiotelephony involves the application of the same principles as are involved in inventions to enable apparatus to select and record accurately one message on a given wave length out of a mass of messages on various lengths. When this latter result has been attained—an unfulfilled promise of some years standing—radiotelephony will quickly follow. The bill is framed to be adjustable to that improvement when it comes, but in the meantime it deals with the art as it exists today.[10]

The Secretary of Commerce set aside 360 meter, and later 400 meter, wave lengths for broadcasting purposes. Application for broadcasting licenses increased so speedily, however, that following the decision of the Court of Appeals for the District of Columbia and the National Radio Convention called in 1923, the Secretary of Commerce abandoned the policy of allocating all broadcasting to two wave lengths and established the system whereby each applicant for a broadcasting license would have assigned to him an individual wave length specified in the license.

This system, however, was disrupted by a decision of the Federal District Court for the Northern District of Illinois.[11] The court held that the Radio Communication Act of 1912 laid down no standards for the restriction by the Secretary of Commerce of operations under a license and that in the absence of any such standards, the Act, if construed to give the Secretary authority to impose restrictions, would then be unconstitutional as delegating to the Secretary legislative power. In casting doubt on the power of the Secretary to impose restrictions not specified by Congress, the decision was contrary to that of the Court of Appeals of the District of Columbia. In view of the conflict, the Secretary of Commerce asked the advice of the Attorney General, who gave it as his opinion[12] that the Secretary had no administrative discretion in assigning wave lengths or hours of operation, or limitations on power. Following that opinion licenses issued by the Secretary of Commerce merely stated whatever wave length, hours, or power the applicant designated.

As a result of the judicial decisions and the opinions of the Attorney General, the Radio Communication Act of 1912 was found to be ineffective to prevent interference between various broadcasters and other transmitters of radio communications. Licensing under the Act became a mere matter of registration similar to that of the registration of vessels under the marine navigation laws.

## MISCELLANEOUS FEDERAL RADIO LEGISLATION

In the interval between the Radio Communication Act of 1912 and the

[10] Senate Report 698, 62d Congress, 2d Session, pp. 7–8.

[11] *United States* v. *Zenith Corporation* (1926), 12 F. (2d) 614; see also *Carmichael* v. *Anderson* (D. C. 1926), 14 F. (2d) 166.

[12] 35 Op. Atty. Gen. 126; see, in accord, unreported opinion in *Chicago Tribune Co.* v. *Oak Leaves Broadcasting Co.* (Circuit Court of Cook County, Ill., 1926); Gen. No. B-126864.

Radio Act of 1927, Congress enacted several minor measures relating to radio communication. One class of these was attributable to war-time conditions, as, for instance, the censorship of messages,[13] the taking over by the President of radio systems of communication,[14] and the taxation of radio communications.[15] Another type of legislation was that providing for the use of the naval radio stations for the transmission of press dispatches and private communications. This enabling legislating made provision for protection from governmental competition of companies affording adequate privately operated facilities.[16]

### THE RADIO ACT OF 1927

In his Annual Message[17] to the Second Session of the 69th Congress, President Coolidge stated:

> Due to decisions of the courts, the authority of the department under the law of 1912 has broken down; many more stations have been operating than can be accommodated within the limited number of wave lengths available; further stations are in course of construction; many stations have departed from the scheme of allocation set down by the department, and the whole service of this most important public function has drifted into such chaos as seems likely, if not remedied, to destroy its great value. I most urgently recommend that this legislation should be speedily enacted.

It was in response to the necessity outlined by the President that the Radio Act of 1927 was enacted.[18]

*The Federal Radio Commission.*—The administration of the Radio Act of 1927 is divided between the Federal Radio Commission and the Secretary of Commerce. The Act created a commission to be known as the Federal Radio Commission composed of five commissioners appointed by the President by and with the advice and consent of the Senate, the appointments to be distributed one from each of the five zones into which the country was divided by the Act. For a period of one year from the first meeting of the Commission, the Commission had, among other matters, authority, from time to time as the public convenience, interest, or necessity required, to classify radio stations; prescribe the nature of service to be rendered by each class of licensed stations and each station within any class; assign bands of wave lengths to each class of stations and each individual station and determine the power which each station shall use and the time during which it should operate; determine the location of classes of stations or individual stations; regulate the kind of apparatus to be used with respect to its external effects and the purity and sharpness of the emissions; and make special regulations applicable to stations engaged in chain broadcasting. At the expiration of the one-year period all authority vested in the Commission, except as to revocation of licenses, is to be transferred to the Secretary of Commerce, and the Commission is to be vested with certain advisory and appellate functions. However, this period, which expired March 16, 1928, was extended by Congress until March 16, 1929.[19]

*Right to Station License.*—Under the Radio Communication Act of 1912 the licenses granted for the use of radio

[13] 40 Stat. 413.

[14] 40 Stat. 904; repealed 41 Stat. 157.

[15] 40 Stat. 315, 40 Stat. 1102, 42 Stat. 284.

[16] 41 Stat. 1061; amended 42 Stat. 495; amended 43 Stat. 1091. Continued in Section 30 of the Radio Act of 1927.

[17] 68 *Congressional Record* 32, December 7, 1926.

[18] 44 Stat. 1162.

[19] 45 Stat. 373. At the time of writing of this article bills have been introduced in Congress for the further extension of the period of the commission's activity.

apparatus or station licenses were limited by the Secretary of Commerce to periods of two years for ship stations and amateurs, one year for point-to-point telegraph, and ninety days for broadcasting. In the opinion of the Attorney General, however, such limitations could not be sustained under the authority granted by the 1912 Act.[20]

In order to meet the dangers to effective Federal regulation, that might flow from the acquisition of vested rights under station licenses of indefinite term, Congress enacted on December 8, 1926, a Joint Resolution—

> That until otherwise provided by law, no original license for the operation of any radio broadcasting station and no renewal of a license of an existing broadcasting station, shall be granted for longer periods than ninety days and no original license for the operation of any other class of radio station and no renewal of the license for an existing station of any other class than a broadcasting station, shall be granted for longer periods than two years; and that no original radio license or the renewal of an existing license shall be granted after the date of the passage of this resolution unless the applicant therefor shall execute in writing a waiver of any right or of any claim to any right, as against the United States, to any wave length or to the use of the ether in radio transmission because of previous license to use the same or because of the use thereof.

The above Resolution remained in force only for the few months preceding the enactment of the Radio Act of 1927 on February 23, 1927. The 1927 Act does not expressly terminate the existing station licenses acquired under the 1912 Act. However, it does in effect reach that result by repealing the 1912 Act and by providing[21] that no person may use or operate any apparatus for the transmission of energy, or communications, or signals by radio (a) in interstate or foreign commerce, (b) upon any vessel of the United States or any aircraft or mobile station in the United States, or (c) within any State when the effects of the use extend beyond the borders of the State or when interference is caused by the use or operation with the transmission or reception of energy, communications, or signals from any place within the State to any place without the State, or vice versa—"except under and in accordance with this Act and with a license in that behalf granted under the provisions of this Act."[22] Licenses are to be issued for broadcasting for terms not longer than three years, and for other purposes for terms not longer than five years, whether the license is issued originally or by way of renewal.[23] Finally, the 1927 Act repeats substantially the waiver provision above quoted except that the waiver shall be only as to the use of any "particular" wave length.

The proper construction of the waiver provision of the 1927 Act would seem to be that the station owner does not waive all rights that he may have in law to operate, but only any right he may have to operate on any particular wave length. In other words, the owner must be afforded some wave length on which to operate, but the selection of the particular wave length is left to the discretion of the licensing authority. The owner of the station acknowledges the power of the licensing authority to change his wave length. Furthermore, it is doubtful if the waiver provision should be construed to deny an existing licensee under the 1912 Act the right to object, on the ground of the denial of due process of

[20] 35 Op. Atty. Gen. 126, July 8, 1926.

[21] Sec. 1.

[22] Sec. 1. See also Sec. 39.

[23] Sec. 9. Under the amendatory Act of 1928, 45 Stat. 373, 83, these periods are made three months and one year, respectively, for licenses issued prior to January 1, 1930.

law, to a decision of the licensing authority denying the existing licensee the right to continue operation or to use an existing wave length. The authority to grant privileges only on condition that the grantee relinquishes constitutional rights has been denied by the Supreme Court.[24]

Whether or not a licensee under the 1912 Act has such a property right to continued use of his apparatus or to its continued use in operating on any particular wave length or at any particular time, that the denial by the licensing authority of the privilege of continuing such use under the 1927 Act would constitute a "taking" of property in violation of the due process clause of the Fifth Amendment to the Constitution, is a constitutional problem, the solution of which presents many difficulties. It has been comprehensively discussed, however, by Judge Stephen Davis, former Solicitor of the Department of Commerce, in his able volume upon the Law of Radio Communication and by the Federal Radio Commission in its statement of September 1, 1928.[25] The problem is further complicated by the fact that the licensee under the 1912 Act must not only execute the waiver in order to obtain a renewal license for continued operation under the 1927 Act, but must also be able to establish that "public convenience, interest, or necessity" will be served by the continued operation. The same requirements as to waiver and as to public convenience, interest, and necessity, apply also to persons contemplating the operation of new stations.

The 1927 Act does not define the term "public convenience, interest, or necessity." However, the Federal Radio Commission specified certain standards in its statement of August 23, 1928.[26] In the view of the Commission the setting aside of a substantial band of frequencies for the exclusive use of broadcasting stations and the radio listening public, the bringing about of the best possible broadcasting reception conditions, and a fair distribution of frequencies among the different types of service, that is, those serving a large territory including rural and sparsely settled regions and those serving intermediate areas and areas local in character, are in the public interest, convenience, and necessity. The commission also makes its allocations in such manner as to avoid too much duplication of programs and types of program, services readily available to the public in any other form, such as, the use of the ordinary phonographic record, broadcasting of an excessive amount of direct advertising and of matters of a distinctly private nature. Finally, the character of the licensee, his financial responsibility and past record, his maintenance of regular schedules and of an adequate control or check on the frequency of his transmitter, and the location of his transmitter within any given region so as to avoid interference, are other considerations.

In addition to the requirement of public convenience, interest, or necessity, the Davis amendment of 1928 requires the allocation of licenses, wave lengths, times for operation, and station power so as to give each of the five regional zones established by the 1927 Act equality of radio broadcasting service, both of transmission and of reception.[27]

[24] *Terral* v. *Burke Construction Co.* (1922), 257 U. S. 529; *Frost* v. *Railroad Commission* (1926), 271 U. S. 583.

[25] Davis, Law of Radio Communication. Pp. 65–9; Annual Report of the Federal Radio Commission for the year ending June 30, 1928, pp. 163–5. See also 27 *Columbia Law Review* 730.

[26] Annual Report of the Federal Radio Commission for the year ending June 30, 1928, pp. 166–70.

[27] 45 Stat. 373, §5.

*Revocation of Station Licenses.*—The station license is revocable by the Federal Radio Commission for false statements made in the application or in the accompanying statement of facts upon citizenship, moral, financial, and technical qualifications, or for conditions revealed in the statement of facts which would have warranted the licensing authority in refusing the granting of the license in the first instance, or for failure to operate substantially as set forth in the license, or whenever the Interstate Commerce Commission or any other Federal body, in the exercise of its lawful authority, finds and certifies to the Federal Radio Commission that any licensee bound so to do, has failed to provide reasonable facilities, or has made unjust or unreasonable charges, or has been guilty of any discrimination in charges or services, or has made any unjust and unreasonable classification, regulation, or practice with respect to transmission of communications or service. Notice and opportunity of hearing are provided for before the order of revocation takes effect.[28]

*Appellate Procedure.*—Any applicant for a station license, or for the renewal or modification of an existing station license, whose application is refused, has a right of appeal from the decision of the Commission to the Court of Appeals of the District of Columbia. Any licensee whose license is revoked by the Commission has the right of appeal from the decision of the Commission to the same court or to the United States District Court for the district in which the apparatus licensed is operated. The court may alter or revise the decision appealed from in such manner as it may seem just. The revision of the court is confined to the points set forth in the reasons of appeal. The Act apparently contemplates that the court will substitute its judgment for that of the licensing authority. This amounts to the placing upon the court of an administrative or nonjudicial function, rather than a judicial function. While non-constitutional courts, such as the District of Columbia courts, may constitutionally be vested with nonjudicial functions, this is not true of constitutional courts such as the United States district courts.[29] The same principle would also seem to deny a right of review in the Supreme Court by certiorari of the decisions of the lower courts.

*Monopoly and Restraint of Trade.*—The Radio Act of 1927 contains numerous provisions directed to the elimination of monopoly and the restraint of trade. Provision is made for special regulations to cover chain broadcasting.[30] No station license is to be granted to any person found guilty by a Federal court of monopolizing or attempting to monopolize radio communication through the control of the manufacture or sale of apparatus, or through exclusive traffic agreements, or by any other means, or to any person found guilty by any such court of having used unfair methods of competition.[31] The anti-trust laws are declared applicable to the manufacture and sale of, and to trade in, radio apparatus, and to radio communications. Furthermore, whenever in any proceeding under the anti-trust laws enforcement or review of orders under laws relating to the Federal Trade Commission or any other governmental agency, any station licensee is found guilty of violation of any of these laws,

[28] Sec. 14.

[29] *Gordon* v. *United States* (1864), 117 U. S. 697; *In re* Sanborn (1893), 148 U. S. 222; *Keller* v. *Potomac Electric Co.* (1923), 261 U. S. 428; *Postum Cereal Co.* v. *California Fig Nut Co.* (1927), 272 U. S. 693; 68 *Congressional Record* 3181–2.

[30] Sec. 4.

[31] Sec. 13.

the court may revoke the station license.[32] Finally, no person in the business of transmitting or receiving for hire radio communications under a license shall directly or indirectly acquire control or operate any interstate or foreign cable, wire, telegraph, or telephone line, if the purpose or effect is to substantially lessen competition, or restrain foreign commerce, or create a monopoly in any line of commerce.[33] The power to revoke station licenses in case the licensee is found to have violated the anti-trust laws, is of present importance in view of the pending court proceedings declaring unlawful certain existing radio patent cross-license agreements.

*Miscellaneous Provisions.*—Among the minor provisions of the Radio Act of 1927 several merit enumeration. Construction permits are required for the building of new stations.[34] No person may operate transmitting apparatus without a license from the Secretary of Commerce.[35] Foreign ships are not required to be licensed, but must observe the regulations designed to prevent interference.[36] Stations designated as liable to interfere with distress signals must have a radio operator listening in on specified wave lengths whenever the station is in operation.[37] All stations must give priority to signals of distress.[38] The uttering or transmitting of false or fraudulent signals of distress, or communications relating thereto, is made unlawful.[39] Whenever a licensee permits a candidate for public office to use a broadcasting station he must afford other candidates for that office equal opportunities. The candidates' communications may not be censored by the licensee.[40] Matter broadcasted for pay must be announced as such at the time of broadcasting.[41] The privacy of communications is protected.[42] Rebroadcasting must be expressly authorized.[43] The licensing authority has no power of censorship or power to interfere with free speech, but no person may utter any obscene, indecent, or profane language by means of radio communication.[44] Other minor provisions are substantially repetitions of some of the safety-at-sea provisions of the Wireless Ship Act of 1910 and the Radio Communication Act of 1912.

### UNREGULATED WAVE CHANNELS

Electric waves whose existence have been ascertained vary in wave length from a twenty-billionth of a centimeter to 2,000,000 centimeters. In this vast spectra radio waves constitute only a small portion of the longer waves. Among other waves are the waves transmitting ordinary electric energy, infra red waves, visible light waves, ultraviolet and X-ray waves, and the gamma waves from radium. These involve the waves which transmit electric power, visible light, heat, the chemically active rays of photography, the X-rays of photography, the radium waves of therapeutics, and other waves whose practical uses have not yet been ascertained.[45]

Of these many classes of electric waves the Radio Act of 1912 regulates only the use of those waves available for radio communication, whether telegraphic or telephonic. Telegraphic

[32] Sec. 15.
[33] Sec. 70.
[34] Sec. 21.
[35] Sec. 5.
[36] Sec. 8.
[37] Sec. 22.
[38] Sec. 23.
[39] Sec. 28.
[40] Sec. 18.
[41] Sec. 19.
[42] Sec. 27.
[43] Sec. 28.
[44] Sec. 29.
[45] See Nichols and Tear, "Joining the Electric Wave and Heat Wave Spectra," Annual Report of the Smithsonian Institute, 1923, p. 175 ff.

communication would include picture transmission and television. Telephonic communication would include broadcasting.

The Radio Act of 1927 defines "radio communication" as—

> any intelligence, message, signal, power, pictures, or communication of any nature transferred by electrical energy from one point to another without the aid of any wire connecting the points from and at which the electrical energy is sent or received and any system by means of which such transfer of energy is effected.[46]

The 1927 Act would seem by reason of the above definition to have added to those channels previously regulated under the 1912 Act, the electric waves available for the transmission of electrical power by wireless. There seems to be no logical reason, however, for assuming that radio and power waves are the only classes of electric waves whose use it will be of practical importance in the future to subject to governmental control. The necessity for regulating the use of other classes of electrical waves may arise not only by reason of interference within any class but by reason of interference between those classes or between any one of the classes and the radio or electric power waves. If the practical uses of other classes of electric waves develop with as much rapidity as did the use of radio waves, the Radio Act of 1927 may prove but the beginning of Federal legislation that will in time cover many other channels within the electric wave spectra.

[46] Sec. 31.

# The Administration of Federal Radio Legislation

By O. H. Caldwell
Federal Radio Commissioner

IN July, 1926, the Attorney General of the United States issued his famous opinion that under the Radio Act of 1912 the Secretary of Commerce was without authority to control wave lengths or powers of broadcasting stations, but must, upon application, issue licenses to any existing or new stations for such wave lengths and powers as the stations themselves requested. With no supervising hand to control interference, many broadcasting stations immediately "pirated" wave lengths in use by or near to other stations, while other broadcasters "jumped" their power, causing cross talk and hetrodyne whistles.

Proper separation between established stations was destroyed by interloping stations camping in the middle of any open spaces they could find, each interloper thus impairing reception of three stations—his own and two others. Instead of the necessary 50-kilocycle separation between stations in the same community, the condition soon developed where separations of 20 and 10 kilocycles, and even 8, 5, and 2 kilocycles, existed. Under such separations, of course, stations were soon wildly blanketing each other while distracted listeners were assailed with scrambled programs.

Wave lengths assigned to Canada were violated, in spite of repeated warnings from the Government and even personal appeals from members of the President's Cabinet that national good faith and international good will were at stake.

Some of the older stations also jumped their power, increasing five to ten times their watts output, and as a result delivering terrific heterodyne interference to distant stations that had been previously undisturbed under the orderly radio pattern developed by the former supervising authorities.

### New Stations Crowd Ether

Meanwhile 250 new broadcasting applicants, who had hitherto been denied licenses by the Commerce Department, because the ether lanes were already manifestly full, now demanded and received permits to broadcast, and these 250 stations, coming on the air, worse confounded the interference already set up by the "pirates" and power jumpers.

So bad had these conditions become by February, 1927, that Congress passed an act setting up a Federal Radio Commission of five members to be appointed by the President and confirmed by the Senate, this Commission to take supervision over the radio situation for one year. At the close of this initial one-year period, the Commission was to transfer its administration function to the Secretary of Commerce, and itself become only an appellate body, meeting upon call to hear appeals from the Secretary's decisions. Later the administrative function of the Commission was extended for a second year, and now a bill has been introduced into Congress extending the Commission for a third one-year period.

The first steps taken by the new Commission in March and April, 1927, were (a) to transfer all stations to authorized channels on "even tens" of kilocycles, (b) to clear the Canadian

waves, and (c) by time-sharing to combine interfering stations and tuck them in wherever possible in the spectrum, in order to keep them in operation without interfering with those stations which had remained faithfully on their assigned channels.

### THE REALLOCATION OF 1927

During the meantime, with the public given partial relief it was possible for the Commission to make a careful study of the whole situation, and, by painstaking planning, arrange for the second big step—a reallocation of all stations in the best interests of the listening public. When this reallocation took effect in June, 1927, listeners found that (a) for each locality local stations were well distributed along the dial, with minimum separations of 50 kilocycles; (b) stations were recognized in terms of position and time on the basis of their demonstrated capacity to serve the public; and (c) heterodyne interference between distant stations, in general, was diminished. These improvements were accomplished by repacking the channels according to an orderly plan, actually increasing the capacity of the 90 channels available.

Sixty-day licenses were issued and the operation of the new allocation carefully watched in the light of actual experience so that necessary changes could be made where interference was experienced. Such actual experience is always necessary in view of the irregular and unpredictable transmission in different directions which almost every station sends out. If the station's radiation went out equally in all directions, making the station's interference area a circle, the task of fitting stations together without interference at minimum distances would be simple. But as every listener knows, some stations are unaccountably heard for many miles in one or more directions, while being shut off by natural "barriers" in other directions. Advantage must be taken of all these curious unpredictable phenomena and adjustments made before any new station setup can be really working at its best. Here only actual experience, and not engineering theory, can be the guide.

### MEMBERSHIP AND ORGANIZATION OF THE COMMISSION

When first appointed, the Federal Radio Commission was composed of the following members: Admiral W. H. G. Bullard, Chairman (Second Zone), Orestes H. Caldwell (First Zone), Eugene O. Sykes (Third Zone), Henry A. Bellows (Fourth Zone), Col. John F. Dillon (Fifth Zone). Commissioner Dillion died on October 8, 1927; Commissioner Bellows resigned on November 1, 1927, and Commissioner Bullard died on November 24, 1927. The loss of each of these three men was severely felt by the Commission, all three of them being of exceptional ability and having expert knowledge in radio matters over which the Commission has jurisdiction.

Mr. Sam Pickard of Manhattan, Kansas, who had theretofore served as Secretary of the Commission, was appointed Commissioner from the Fourth Zone on November 1, 1927. Mr. Harold A. Lafount of Salt Lake City, Utah, was appointed Commissioner from the Fifth Zone in November, 1927. Judge Ira E. Robinson was appointed Commissioner from the Second Zone in April, 1928.

### ENGINEERING AND LEGAL DIVISIONS

Prior to August, 1928, the Commission had no regularly organized Engineering Division. It had had generous assistance from the Bureau of Standards of the Department of Commerce and, particularly, of Dr. J. H. Dellinger, Chief of the Radio Division

of that Bureau. It had the assistance, until July 30, 1928, of Captain S. C. Hooper of the United States Navy (recently appointed Chief of Naval Communications) who, at the request of the Commission, was detailed to assist in a study of the complex technical problems arising in connection with the allocation of channels in the short-wave band. The Commission also had the assistance of Captain Guy Hill of the Signal Corps of the United States Army, and Commander Tunis A. M. Craven, of the United States Navy, who were similarly detailed. On August, 1928, Dr. Dellinger was offered and accepted the position of Chief Engineer of the Commission.

The Commission had no Legal Division until June 25, 1928. The Department of Justice had from time to time detailed Mr. Bethuel M. Webster, Jr., Special Assistant to the Attorney General, to assist the Commission in the handling of particular hearings. On June 25, 1928, the position of General Counsel was offered to and accepted by Mr. Louis C. Caldwell of Chicago, Illinois, a brilliant young attorney with a unique insight into the technical problems of radio. General Counsel Caldwell now has three lawyers assisting him.

### COMMITTEES OF THE COMMISSION

At an organization meeting of the Commission early in 1928, the Commission determined upon the following special assignments and classification of responsibilities among the individual commissioners:

Judge Ira E. Robinson, law and forms.

Judge Eugene O. Sykes, hearings and docket, short and long waves.

Commissioner O. H. Caldwell, technical advances, short and long waves, broadcast reallocation, foreign relations, television.

Commissioner Sam Pickard, broadcast reallocation, studio announcing, aviation uses of radio, relations with press.

Commissioner Harold Lafount, budget and finance, office employees, licensing routine, coöperation with Commerce Department, broadcast reallocation, television.

### CHANNELS RESERVED FOR USE BY CANADA

One of the first acts of the Commission on assuming office was to clear six channels, which, under an informal understanding arrived at between the Department of Commerce and Canadian representatives, had been reserved for exclusive use by Canada. At that time there were 41 American stations on those channels or so close thereto as to cause fatal interference with the Canadian stations.

Since that time the Commission has maintained the policy of keeping these channels clear and of regulating the use of eleven other channels shared by Canadian and American stations. The proper regulation of the shared channels necessitates a limitation on the power of stations assigned to these channels on either side of the boundary line. Obviously stations located relatively close to the boundary line can be assigned only a very small amount of power, while stations located at greater distances, such as the south of the United States, can safely be authorized to use as much as 500 watts.

The question of the allocation of broadcasting channels between the United States and Canada cannot as yet be regarded as definitely determined. During the past year representatives of Canada have strongly protested against the present basis as being unfair to Canada, and there seems to be a disposition to press a demand for an increased assignment on the part of that country. The present allocation, however, is based on the respective populations of the two coun-

tries, and there is considerable evidence that the programs of American stations are very popular in Canada. The Commission believes, therefore, that the allocation as it now stands is fair to Canada and should not be changed. A more scientific choice of frequencies for the purpose could be made than that now in force. So far there has been no serious problem of interference with broadcasting stations of other countries including Mexico and Cuba.

Radio reception conditions were far from satisfactory as the result of the Commission's reallocation of June 15, 1927. The reallocation had succeeded to a marked extent in reducing interference arising from congestion in the larger metropolitan centers, where the stations were crowded together without adequate frequency separation. It had not, however, succeeded in remedying the heterodyne interference (resulting from two or more stations operating on the same channel) which was ruining reception in rural areas and in all parts of the country not in the immediate vicinity of any stations. The complaints which deluged the Commission soon made it apparent that drastic changes would eventually have to be effected.

## THE DAVIS-DILL AMENDMENT

Meanwhile, the problems of the Commission in endeavoring to achieve better radio reception and at the same time to work toward the "fair, efficient and equitable radio service," as between the different states and communities, as required by Section 9 of the Radio Act of 1927, were multiplied by the Amendment of March 28, 1928. This Amendment, known as the Davis Amendment, requires that the radio supervising authority

> shall as nearly as possible make and maintain an *equal* allocation of broadcasting licenses, of bands of frequency or wave lengths, of periods of time for operation, and of station power, *to each of (the five) zones*, and shall make a fair and equitable allocation of licenses, wave lengths, time for operation, and station power *to each of the states* . . . within each zone, *according to population*.

The proportion of the total national radio facilities due each state is, therefore, fixed by law, and is shown in the appended table by the percentages in Column B—based upon official estimates of 1928 populations (Column A) prepared by the U. S. Census Bureau.

## MAXIMUM OF SIMULTANEOUS BROADCASTING

The maximum of total broadcasting service which can be simultaneously carried on without interference, under the present status of the law and the radio art, has been determined by the Radio Commission and its engineers, after exhaustive study and experiment, as comprising the simultaneous operation of 40 stations of 5 kw. and upwards, on cleared channels; 125 regional stations of 500 to 1,000 watts; and 150 local stations of 10 to 100 watts.

By time divisions, a larger number of actual transmitters can, of course, be operated at different times on those "assignments," but the total stations running at any one moment during the night hours must not exceed the above limit, if good radio reception is to be preserved.

Dividing this national maximum into five equal parts for the zones, and also applying the state percentages of Column B, we obtain the number of each class of station "assignments" due each state.

Obviously, a given number of broadcasting stations of given power will give much better service to a zone which is small in area than to a zone which is large in area. The Amendment made it very difficult for the Commission to

take advantage of the difference in time between the Atlantic and Pacific coasts, of the daytime operation of stations, of the greater use of Canadian-shared channels which is possible in the South, and other considerations which could not easily be accommodated to rigid mathematical equality. The "borrowing" clause proved to be of practically no assistance in solving the problem because all channels were in demand in their zones of original assignment.

There was in the Commission a difference of opinion as to the intention of Congress with regard to the method of putting the Amendment into force. A majority of the Commission construed the Amendment as requiring an immediate reallocation of broadcasting facilities so as to attain the prescribed equality. There has also been a difference of opinion as to whether the Amendment, properly construed, requires an equality in number of licensed broadcasting stations by zone without regard to division of time or whether two or more stations dividing time in one zone may be balanced as against one station occupying full time in another zone.

The difficulty in the way of an immediate compliance with the Amendment is apparent from an inspection of the following table showing the distribution of broadcasting facilities of the United States on June 30, 1928:

| Zone | Total Number of Stations | Total Frequencies in Use | Total Power (Watts) |
|---|---|---|---|
| 1..... | 128 | 64 | 228,135 |
| 2..... | 112 | 53 | 109,990 |
| 3..... | 116 | 54 | 59,535 |
| 4..... | 206 | 73 | 162,605 |
| 5..... | 134 | 74 | 67,145 |

The Commission held a hearing on April 6, 1928, which was attended by a large number of radio engineers. Dr. J. H. Dellinger, of the Bureau of Standards, acted as Chairman of the Conference. The engineers present adopted a resolution favoring an allocation calling for 50 cleared channels and 36 regional channels. The broadcasting committee of the Institute of Radio Engineers also submitted a report, likewise favoring the plan of allocation with 50 clear channels.

The Allocation Plan, as finally adopted by the Commission, was drawn up with six purposes in mind:

1. To arrange for the maximum total use of the broadcasting channels.

2. To divide such total use with exact equality among the five zones (and within the zones proportionally among the states according to population) as required by law.

3. To secure good radio reception in all parts of the country, and particularly to bring a fair diversity of programs to every home in the United States, including the remote 50,000,000 of our population on farms and ranches, in the mountains, along the coasts, and in towns, villages and cross-roads, more than 100 miles from any broadcasting station.

4. To provide for a large number of local broadcasting stations of limited power, so that communities not now equipped with stations, may have opportunity to broadcast local and neighborhood events and features within the restricted range of local interest, without interfering with the widely popular regional programs which are the backbone of broadcast-listener interest today.

5. To continue the operation of all present licensed transmitters under some basis of time-sharing in the cases of stations in localities where the quota is insufficient to care for the existing number of transmitters.

6. To minimize so far as possible the upsetting or modification of as-

signments of popular stations having great followings of listeners.

### ASSIGNMENT OF THE NINETY BROADCASTING CHANNELS

Under the plan adopted by the Commission, the 90 channels of the broadcasting band (exclusive of the Canadian channels) are assigned as follows:

1. Forty rural service channels providing full-service-range operation of stations, for the benefit of remote, as well as nearby listeners. On these 40 channels, by taking advantage of time differences, it has been possible to obtain the equivalent of 42 to 43 full-time assignments for stations of 5,000 watts and above, thus affording more than eight full-time positions for each zone. (The word assignment as used here, refers to the equivalent of full-time operation for a station of the power designated. Actually, of course, such an assignment may be shared by two or more stations, sharing time.) A large number of additional "daylight-only" positions are also assignable to these channels, perhaps ten or more stations per zone. With these daylight stations added to the 60 different transmitters assigned to share the 40 full-time positions, it becomes apparent that these 40 channels will be subject to use each day by more than 100 different transmitters or stations,—an average of nearly three stations per channel.

2. Four 5,000-watt limited-service channels, each channel carrying two to three 5,000-watt stations, each operating full time. With ten total positions of this class available, each zone has two assignments. These assignments are at the 200-meter or 1,400-kilocycle end of the spectrum. While of limited service range on many nights, owing to the presence of another 5,000-watt station half way across the Continent, these channels can be operated in a clear condition by time-sharing or by synchronizing.

3. Forty regional-service channels for stations of 250, 500 and 1,000 watts. By wave-sharing, 125 full-time positions are obtained on these 40 channels, or 25 full-time positions per zone for stations of 250, 500 and 1,000 watts. Each such assignment may be occupied by either one or two or more actual licensed transmitters. Thus, by time-division, the actual number of transmitters to be licensed can be increased to the limits desired.

4. Six local-service channels for stations of 10 to 50 to 100 watts power. Each such channel will carry 30 full-time 100 watt positions, making 180 in all. Each zone will have 30 full-time 100-watt positions, each position subject to time-division. With local stations dividing time, say three transmitters per position, it will be seen that space is provided for 450 small stations of the 100-watt local class.

By the arrangement above outlined a total of 315 full-time positions for broadcasting stations of all ratings is carried on the 90 channels. Or, phrased differently, 315 different stations (including locals) may operate simultaneously on these 90 wave lengths. With time-divisions, the total number of transmitters that will be licensed will, of course, exceed this figure, since every present licensed transmitter is being extended by the Commission under the new allocation to operate part-time or full-time.

### ASSIGNMENTS TO EACH ZONE

Recapitulating now, by zones, the above analysis of channel assignments, it will be seen that each of the five zones will have full-time positions on the air assigned to it, as follows:

1. Eight rural-service positions, suitable for stations of unlimited power—5,000 to 50,000 watts.

2. Two limited-service positions for 5,000-watt stations at 1,460 to 1,490 kilocycles (the range of which stations may be greatly increased to

full-service-range by mutual time-sharing or mutual synchronizing between the stations sharing the channel).

3. Twenty-five regional positions for stations of 250, 500 and 1,000 watts.

4. Thirty-three local-service positions for stations of 10 to 50 to 100 watts. By sharing time, three transmitters to a position, since most such local stations desire to run only one or two nights each week, 75 such local stations can be accommodated in each zone,—although the number to be licensed in each zone will be limited to such number as will equalize the total number of station licenses per zone. These "local" stations are designed for assignment to towns and communities not already having a broadcasting station.

As before explained, by time division on these positions the total number of actual transmitters to be licensed may be increased within the limits of the equality of licenses between zones prescribed by Congress.

In addition to the night-time positions already listed, a number of daylight-only stations can be successfully operated without interference, up to nightfall. The limiting number of such stations is dependent upon the powers authorized.

### IMPROVES SITUATION FOR RURAL LISTENERS AND SMALLER STATIONS

General Order No. 40, embodied the November 11th allocation listings as above outlined. Engineers who have examined the allocation declare that the plan offers a comparatively high grade of reception on at least 75 channels out of the 90 on the listener's dial. In contrast, the set-up of last winter showed only 20 channels offering a similar standard for winter-night reception.

Millions of rural listeners in the agricultural sections and in remote towns and villages are the chief beneficiaries of the new arrangement,—especially in their ability to hear clearly smaller stations in their own neighborhoods and states.

Improved service to farm listeners is also being obtained on the high-power rural-service channels. On each such channel only one station is permitted to operate at any one time during night hours, thus insuring clear reception of the station's program, up to the extreme limit of its service range. And since eight "high-power" rural-service channels will be assigned to each of the five zones, wide geographical distribution of the country's higher-power broadcasting facilities will be assured to reach rural audiences in all sections.

On 34 of the 39 channels shared by 1,000-watt and 500-watt regional stations, limits of two or three stations per channel have been placed, while between stations spacings generally of 1,200 to 1,000 miles have been observed, with few spacings less than 1,000 miles. Many of these 500-watt regional stations furnish important services to farmers and rural residents in their own and neighboring states, and the new operating conditions will extend the service areas of these worthy transmitters to the full reach of their signals on what are essentially "cleared" channels.

Throughout the whole allocation, the matter of wide geographical spacings between stations on adjoining channels has been carefully watched, in this way eliminating the objectionable "cross-talk" in the receivers of rural listeners.

The smaller broadcasters also enjoy improved operating conditions under the November 11th allocation, for channels on which such regional stations operate will be largely cleared of interference, enabling 500-watt and 100-watt stations to reach out further than has been possible since 1926. The local 100-watt stations have also

been given particular consideration, since the plan provides for full-time assignments for such local community broadcasters practically equalling in number the total of all the larger classes of broadcasters put together.

### OUTSIDE THE BROADCASTING BAND

So much for the broadcasting wave lengths. Outside of broadcasting, the Commission has many other responsibilities. To investigate these other wave lengths, let us start with the listener's own home radio set. As you turn your dial back and forth you "tune in" different broadcasting stations. But now suppose you turn it to the right, past WEAF,—finally you come to a dead stop.

What is beyond that barrier?

If your home set could tune further up the scale in that direction, you would find yourself listening to airplanes communicating with their ground stations; then would come ships calling each other at sea,—even perhaps a faint S. O. S.,—and radio compasses, airplane beacons, and other aids to navigation. Then turn the dial further and you would listen in on the great trans-Atlantic high-speed circuits communicating with Europe, and also the trans-Atlantic telephone conversations linking New York with London and Paris. These are the so-called "*long waves*"—up beyond the upper end of your dial.

Now turn back your imaginary dial (for no single radio set will actually listen to all these widely different wave lengths), and once more swing down through the broadcast band—way down—and finally you enter the unclaimed stretches of the "short waves." Here is a new wide field for which a variety of commercial applicants are now contending. Once the playground of the amateur only, now some of the most valuable parcels of the whole radio spectrum are believed to be numbered among these short waves or high frequencies.

Television, when it comes, will probably be quartered here.

Some of these short waves are transoceanic in reach, and are wanted by the regular communication companies, by newspaper services, and others. Some are most suitable for shorter distances, and are in demand by a host of public-service and private interests. The simple if paradoxical rule to remember here is that while the shorter waves work best over longer distances, the longer short waves are good for the shorter distances.

Among those who have appeared before the Commission applying for channels in this short-wave field, are: newspaper services; communication companies—domestic and transoceanic; airplane operating companies; navigation companies; railroads; department store chains; electric railways; interurban bus systems; electric power transmission systems; mining and oil companies; lumber companies; farm cooperative organizations; motion picture producers; police and fire alarm systems; forest and watershed patrols; ranch owners; remote resorts and hotels; operators of facsimile transmission services; radio manufacturers; television inventors; radio broadcasters; packers and shippers; and geologists.

In addition, representatives of the Army and Navy and of other Government services which operate or supervise short wave communication systems, ship compasses, ship beacons, fog signals, airplane services, airplane beacons and miscellaneous short-wave systems have coöperated with the Commission in outlining the developments which they are making and which might be affected by assignment of nearby short-wave channels to commercial services.

Representatives of each class of com-

mercial service applied for have been particularly invited to discuss: (1) the dependence of such service upon short-wave radio rather than wire or other means; (2) the humane, social and economic importance of their proposals; (3) the number and position of channels believed available for such service; (4) the power required and interference likely to be caused to other services and other countries; and (5) the probable total number of applications which will be made for such service within the next five years by all applicants in their class.

While no licenses have yet been granted in the short-wave region, except to transoceanic companies doing a communication and newspaper business and to the amateurs and experimenters, the Commission will shortly take up the licensing of some five hundred channels in this new field. These short-wave assignments will be in addition to the existing station licenses on other frequencies now in force under the Commission's authority, for we have already licensed operations on all the various waves of the spectrum:

600 Broadcasting stations
2,166 Ships
65 Shore-to-ship stations
85 Transoceanic stations
280 Point-to-point, continental
17,000 Amateurs
203 Experimental
31 Trade and technical schools

Thus it will be apparent that although the broadcasting field may occupy the center of public interest, it is in the other divisions of the radio spectrum and particularly in the short waves that the responsibilities of the Radio Commission are greatest, in number and undoubtedly in economic importance.

## APPENDIX

RADIO FACILITIES DUE EACH STATE
As Required by the "Equitable Allocation" Clause of the 1928 Act of Congress
FIRST ZONE (O. H. Caldwell, Commissioner)
Number of Full-time "Assignments" Due States (See Notes, page 12)

| | A Population of State (1928) | B Percentage of Total National Facilities Due State | C Rural Service, 5 kw. and Above | D Regional Service, Chiefly 500–1,000 w. | E "Local," Chiefly 50 w. and 100 w. |
|---|---|---|---|---|---|
| Maine | 795,000 | .6 | ... | .7 | .9 |
| New Hampshire | 456,000 | .3 | ... | .4 | .5 |
| Vermont | 352,428 | .3 | ... | .3 | .4 |
| Massachusetts | 4,290,000 | 3.1 | 1.2 | 3.9 | 4.7 |
| Connecticut | 1,667,000 | 1.2 | .5 | 1.5 | 1.8 |
| Rhode Island | 716,000 | .5 | ... | .7 | .8 |
| New York | 11,550,000 | 8.4 | 3.5 | 10.6 | 12.7 |
| New Jersey | 3,821,000 | 2.8 | 1.1 | 3.5 | 4.2 |
| Delaware | 244,000 | .2 | ... | .2 | .3 |
| Maryland | 1,616,000 | 1.2 | .5 | 1.5 | 1.8 |
| District of Columbia | 552,000 | .4 | ... | .5 | .6 |
| Porto Rico | 1,299,809 | .9 | ... | 1.2 | 1.4 |
| Virgin Islands | 26,051 | .02 | ... | ... | ... |
| | 27,385,288 | 20.00% | 8.0 | 25.0 | 30.0 |

SECOND ZONE (Ira E. Robinson, Commissioner)
Number of Full-time "Assignments" Due States (See Notes, page 12)

| | A Population of State (1928) | B Percentage of Total National Facilities Due State | C Rural Service, 5 kw. and Above | D Regional Service, Chiefly 500–1,000 w. | E "Local," Chiefly 50 w. and 100 w. |
|---|---|---|---|---|---|
| Pennsylvania | 9,854,000 | 7.0 | 2.8 | 8.8 | 10.5 |
| Virginia | 2,575,000 | 1.8 | .7 | 2.3 | 2.7 |
| West Virginia | 1,784,000 | 1.2 | .5 | 1.5 | 1.8 |
| Ohio | 6,826,000 | 4.9 | 2.0 | 6.1 | 7.3 |
| Michigan | 4,591,000 | 3.3 | 1.3 | 4.1 | 4.9 |
| Kentucky | 2,553,000 | 1.8 | .7 | 2.3 | 2.7 |
| | 28,123,000 | 20.0% | 8.0 | 25.0 | 30.0 |

THIRD ZONE (E. O. Sykes, Commissioner)
Number of Full-time "Assignments" Due States (See Notes, page 12)

| | A Population of State (1928) | B Percentage of Total National Facilities Due State | C Rural Service, 5 kw. and Above | D Regional Service, Chiefly 500–1,000 w. | E "Local," Chiefly 50 w. and 100 w. |
|---|---|---|---|---|---|
| North Carolina | 2,938,000 | 2.1 | .8 | 2.6 | 3.1 |
| South Carolina | 1,864,000 | 1.3 | .5 | 1.7 | 2.0 |
| Georgia | 3,203,000 | 2.3 | .9 | 2.9 | 3.4 |
| Florida | 1,411,000 | 1.0 | ... | 1.3 | 1.5 |
| Alabama | 2,573,000 | 1.8 | .7 | 2.3 | 2.7 |
| Tennessee | 2,502,000 | 1.8 | .7 | 2.2 | 2.7 |
| Mississippi | 1,790,618 | 1.3 | .5 | 1.6 | 1.9 |
| Arkansas | 1,944,000 | 1.4 | .5 | 1.7 | 2.1 |
| Louisiana | 1,950,000 | 1.4 | .5 | 1.8 | 2.1 |
| Texas | 5,487,000 | 3.9 | 1.5 | 4.9 | 5.9 |
| Oklahoma | 2,426,000 | 1.7 | .7 | 2.2 | 2.6 |
| | 28,088,618 | 20.0% | 8.0 | 25.0 | 30.0 |

FOURTH ZONE (Sam Pickard, Commissioner)
Number of Full-time "Assignments" Due State (See Notes, page 12)

| | A Population of State (1928) | B Percentage of Total National Facilities Due State | C Rural Service, 5 kw. and Above | D Regional Service, Chiefly 500–1,000 w. | E "Local," Chiefly 50 w. and 100 w. |
|---|---|---|---|---|---|
| Indiana | 3,176,000 | 2.4 | 1.0 | 3.0 | 3.6 |
| Illinois | 7,396,000 | 5.5 | 2.2 | 7.0 | 8.3 |
| Wisconsin | 2,953,000 | 2.2 | 1.0 | 2.8 | 3.3 |
| North Dakota | 641,192 | .5 | ... | .6 | .7 |
| Minnesota | 2,722,000 | 2.0 | .8 | 2.5 | 3.0 |
| South Dakota | 704,000 | .5 | ... | .7 | .8 |
| Iowa | 2,428,000 | 1.8 | .7 | 2.3 | 2.7 |
| Nebraska | 1,408,000 | 1.1 | ... | 1.3 | 1.6 |
| Kansas | 1,835,000 | 1.4 | .5 | 1.7 | 2.0 |
| Missouri | 3,523,000 | 2.6 | 1.1 | 3.3 | 4.0 |
| | 26,786,192 | 20.0% | 8.0 | 25.0 | 30.0 |

FIFTH ZONE (H. A. Lafount, Commissioner)
Number of Full-time "Assignments" Due States (See Notes, page 12)

| | A Population of State (1928) | B Percentage of Total National Facilities Due State | C Rural Service, 5 kw. and Above | D Regional Service, Chiefly 500–1,000 w. | E "Local," Chiefly 50 w. and 100 w. |
|---|---|---|---|---|---|
| Montana | 548,889 | 1.0 | ... | 1.2 | 1.5 |
| Idaho | 546,000 | 1.0 | ... | 1.2 | 1.4 |
| Wyoming | 247,000 | .4 | ... | .5 | .7 |
| Colorado | 1,090,000 | 2.0 | .8 | 2.4 | 2.9 |
| New Mexico | 396,000 | .7 | ... | .9 | 1.0 |
| Arizona | 474,000 | .8 | ... | 1.0 | 1.2 |
| Utah | 531,000 | .9 | .4 | 1.2 | 1.4 |
| Nevada | 77,407 | .1 | ... | .2 | .2 |
| Washington | 1,587,000 | 2.8 | 1.1 | 3.5 | 4.2 |
| Oregon | 902,000 | 1.6 | .6 | 2.0 | 2.4 |
| California | 4,556,000 | 8.2 | 3.3 | 10.2 | 12.1 |
| Territory of Hawaii | 255,912* | .5 | ... | .6 | .7 |
| Alaska | 55,036* | .1 | ... | ... | .2 |
| | 11,266,244 | 20.0% | 8.0 | 25.0 | 30.0 |

* 1920.

Notes on accompanying figures showing "Radio Facilities Due Each State":

"ASSIGNMENTS"—The figures in Columns C, D and E do *not* show the total number of stations to be licensed. They show *only the number of full-time (24-hour) "assignments" due the various states.* Each such assignment may be occupied either by one full-time station, or by two, three or more stations *sharing time.* Such time-sharing of assignments will be necessary in states and localities where the number of licensed stations exceeds the number of "assignments" available.

RURAL SERVICE—Column C, it will be noted, lists assignments for stations of 5 kw. and upwards, only where the state's quota is approximately *half-time or more,*—on the basis that the great expense of building or operating a 5-kw. station would not be justified for less than half-time operation. States whose quotas on these Rural Service channels are small fractions will presumably be served by stations in neighboring states (with which their fractional quotas may be combined).

REGIONAL SERVICE—Column D lists assignments for regional stations, including under the allocation plan, chiefly 500-w. and 1,000-w. stations, but also a limited number of 250-w. stations (principally on Canadian-shared channels) and also ten 5-kw. limited-service stations in the 1460–1490-kc. range, having regional service.

LOCAL SERVICE—Column E lists assignments for "local" community stations with ratings of 10 w. to 100 w. These assignments provide primarily for communities having no other broadcasting stations; hence such local assignments are automatically not fully available in regions and communities having extensive broadcasting facilities in other classes. "Local" assignments are, however, always fully available in all sections and communities having no other nearby stations.

DAYLIGHT SERVICE—The allocation plan is essentially built upon the requirements of night time, when transmission distances are greatest, and interference is at a maximum. In the daytime, on account of the reduced transmission distances obtainable, simultaneously-operating stations can be closer together. In consequence, a number of additional stations for daylight operation only (equally divided between the zones) can be incorporated into the broadcasting set-up here shown, without causing any interference.

# The Commercial Uses of Radio

By General J. G. Harbord
President, Radio Corporation of America

TO a surprisingly large number of people, radio is an awe-inspiring subject. While true that its technique is a highly complicated one, nevertheless the question, "What is radio?" can be answered simply and directly. Radio is an up-to-date means of flashing intelligence through space. If we couch this intelligence in the dots and dashes of the coded message, we have wireless telegraphy; if we transmit sound itself, either in the form of the spoken word or as vocal or instrumental music, we have broadcasting; if we flash a "still picture" through space as the facsimile of the printed page, signature or legal document, we have photo-radio; and when we are able to send the moving image—as we are now doing on a small scale in the laboratory—we shall have achieved the ultimate in radio transmission and reception—television.

## Radio Development

Commercially, radio has developed along three major lines as follows:

(a) *Marine Radio.*—This was the initial as well as the most logical application of radio to the field of commercial activity, and it speedily fulfilled a need which was at once obvious and vital. For the first time in the history of the world, it placed at the disposal of the navigator a genuinely reliable means of communication with other ships and the shore.

(b) *Transoceanic Radio.*—As the commercial possibilities of radio became manifest, new and improved apparatus made possible the establishment and maintenance of uninterrupted, economical communication between points separated by thousands of miles of ocean wastes, and even across entire continents.

(c) *Broadcasting.*—Without question, this is the most conspicuous and popular phase of the radio art. It has aptly been called the "surprise party" of radio. In the beginning, it was a mere experiment in radio-telephony, but such was its appeal to the public fancy that it developed, almost overnight, into one of the country's most powerful and flourishing industries.

Each of these three commercial phases of radio contains the elements of a story of absorbing interest. Space limitations prevent us from going into them in any considerable detail. Nevertheless, we shall attempt to outline the salient and arresting features of all three.

## Marine Radio

As long ago as 1895, Marconi had demonstrated, with conclusive finality, that intelligible, coded signals could be flashed through the ether. Further, the utter indispensability of radio on shipboard had been forcibly and almost tragically impressed on the public mind at the time of the collision between the steamships *Florida* and *Republic* in January of 1909. Nevertheless, during all these years and, indeed, for many years thereafter, maritime radio was left, for the most part, to its own devices. Yet in spite of this, there had been developed, by 1920, a chain of

coastal stations which, taken together, formed a genuinely efficient marine radio service. These stations, twelve in number, were situated along the Atlantic seaboard from Bar Harbor, Maine, to Cape May, New Jersey, and all operated on a wave length of either 450 or 600 meters.

If we stop to consider that these restricted channels handled approximately 90 per cent of all marine telegraphic traffic, we can better visualize the confusion which must have obtained. And, to further complicate matters, broadcasting made its début about this time. As the hundreds of broadcasting stations which sprang up throughout the country made haste to occupy all possible wave lengths on either side of the two channels set aside as the special province of marine radio, matters grew steadily worse. The opportune advent of the vacuum-tube transmitter, however, averted chaos.

The first vacuum-tube transmitter was installed at Marion, Mass., and operated by remote control from the Chatham Marine Radio Central, 55 miles away. The success of the new transmitter was immediate and astounding. It not only set new records in long-distance communication, but also gave marine radio the added feature of multiplex operation. Chatham, for example, was equipped to receive from three ships and transmit to a fourth at the same time. Six of the scattered twelve coastal units heretofore serving the coastwise and transatlantic shipping suspended operation indefinitely, and the use of those land spark stations, which had hitherto interfered with broadcast entertainment, was discontinued as speedily as possible.

During the past few years, hundreds of vessels have adopted the vacuum-tube transmitter in place of the obsolete spark type. The transition has necessarily been and must continue to be gradual, for although the superiority of the former is everywhere recognized, the investment represented in the old equipment is considerable. Nevertheless, approximately 30 per cent of our merchant marine has effected the change, while in all, more than 550 American vessels are now equipped with transmitters of the improved vacuum-tube type. Indeed, we may safely assume that within a very few years, the spark transmitter will be a thing of the past on all vessels flying the Stars and Stripes.

A few years ago, the range of our marine coastal stations was so limited that it was virtually necessary to broadcast messages to ships at sea, or to relay messages from ship to ship, to their destination. Today, there are few ships indeed which our land stations cannot reach directly. As a result, the cost of marine radio service has been materially reduced. Again, the sharp tuning which goes hand in hand with continuous-wave operation has made it possible for us to establish many channels within a narrow wave band. Lastly, interference has been reduced to a minimum, due, in large part, to the choice of several channels as against the limited channels available with the old spark apparatus.

So great were the demands of Great Lakes shipping, for example, that two new stations had recently to be erected at Buffalo and Duluth to assist those already in operation at Chicago and Cleveland. Today, these four units are handling, with consummate ease, an amount of traffic far in excess of that which formerly taxed the facilities of no fewer than fourteen spark stations.

Before we complete our brief survey of marine radio, I should like to make some reference to the part which it has played in navigation and transoceanic flying. At the beginning of 1928,

some 300 American ships were equipped with the RCA direction finder, or radio compass, while the Bureau of Lighthouses had established radio beacons at various danger points along our coasts. Thanks to the radio direction finder, no navigator need henceforth be in ignorance of his true bearing or position at any time; and thanks to the radio beacon, ships can now proceed in the densest fogs with safety.

Although radio did not itself participate in some of the early transoceanic flights, it nevertheless played a most important rôle in all of them. For weeks and even months before the aviators "hopped off," the U. S. Weather Bureau leaned heavily upon radio in gathering invaluable meteorological data and in preparing accurate weather forecasts by means of bulletins received from ships at sea along the proposed route. In more recent flights, however, aviators have taken the precaution to equip their planes with radio apparatus. This has made it possible for them to maintain contact with ships and shore during their hazardous undertakings.

### TRANSOCEANIC RADIO

The story of transoceanic radio properly begins with man's first attempt to enlist the aid of electricity in the solution of his communications' problems. This dates back to the year 1837 when Samuel F. B. Morse evolved the first practical telegraph. The expansion and development of this instrument is too well known to be repeated here. Suffice it to say that the first major obstacle which it encountered, water, paved the way for the introduction of a second system of communication which was soon to become a dominant factor in international trade—submarine telegraphy.

It was a comparatively simple matter to link Greak Britain and France by means of the submarine cable, but when pioneer experimenters tried to span the whole breadth of the Atlantic, they encountered innumerable difficulties. The history of these early attempts is a record of bitter disappointments and failures, and it was not until 1866 that nearly twenty years of constant effort yielded success. Great Britain speedily took the lead in the development of the submarine cable; and this, for two reasons: first, international trade was and is of prime importance to the growth and existence of the British Empire; second, the supply of gutta percha, the only known insulator for submarine cables, was a British monopoly. So thoroughly did England apply herself to the problem in hand that within the short space of five decades, her domination of the submarine cable field was virtually absolute. At the outbreak of the Great War in 1914, practically all the cable lines in the world converged in the city of London.

Unchallenged though she was in this field, England had strenuous and somewhat unexpected competition from another quarter; for, in an attempt to solve their own individual and pressing communication problems, the other nations of the world had turned to radio. France and Germany in particular had ambitious plans for world-wide networks of radio. England, too, did not intend to be taken unawares; in an "All-Red Chain," she had a similar project of her own quite as comprehensive as that of any of her neighbors. For the most part, these pre-war networks were purely theoretical. Viewed dispassionately in the light of the development of the radio art up to that time, they were altogether too presumptuous. Furthermore, the motives behind many, if not all of these circuits, were military rather than commercial.

To the nations of Europe, the out-

break of the Great War caused the temporary abandonment of their radio schemes. To the United States, however, it signalized a revolution in industrial methods and processes, and for the first time in its history, the research laboratory was elevated to the position of importance which it deserved in our national life. It was in this spirit that the problem of a high-frequency alternator, capable of producing 50,000- to 100,000-cycle alternating current, was approached. Radio engineers had long realized that if practicable transoceanic radio were ever to be achieved, constant and reliable high-frequency energy was absolutely essential.

The problem finally succumbed to the genius of Dr. E. F. W. Alexanderson of the General Electric Research Laboratory. Due to the exigencies of the war, the development of the Alexanderson alternator was pushed with all possible speed, and the device saw constant transoceanic radio service during the closing months of the conflict. Settling new standards for reliability and economy, the Alexanderson alternator attracted the attention of the world-famous British Marconi Company which, at the conclusion of the war and after an interval of four years, was about to resume work on the "All-Red Chain." This great organization was prepared to place $5,000,000 worth of orders with the General Electric in return for the *exclusive* rights to the use of the new alternator.

The British Marconi Company was the only logical customer. The General Electric was on the point of accepting its offer, when something happened which changed the course of the communications' history of both this country and the world at large. President Wilson, then in Paris for the Versailles Treaty, realized that if the British were to secure the Alexanderson alternator on their exclusive terms, they would soon enjoy a lead in the radio field comparable with the domination which they already exercised over the submarine cables of the world. He therefore sent the late Admiral Bullard and Captain Hooper to the General Electric with the request that this organization decline the offer.

By complying with this request, the General Electric Company left itself without an outlet for one of the most expensive pieces of equipment it had undertaken to develop. Further, although the British had failed in their attempt to obtain the alternator rights, America was without a communications organization to employ them. Thus, in an effort to clarify the situation the American Telephone and Telegraph Company, the Western Electric Company, the Westinghouse Electric and Manufacturing Company, and the United Fruit Company joined with the General Electric in the formation of a completely American-owned and operated communications organization, named the Radio Corporation of America. The property and rights of the British-owned Marconi Company of America were taken over by the new organization. For the first time, therefore, the control of American radio was in American hands.

Today, the RCA world-wide wireless service offers direct communication between New York City and England, France, Germany, Portugal, Italy, Holland, Belgium, Sweden, Norway, Poland, Turkey, Liberia, Cuba, the Argentine, Brazil, Colombia, Chile, Venezuela, Porto Rico, the Dutch West Indies and Dutch Guiana. From San Francisco, circuits reach to Hawaii, China, Japan, the Philippines, Dutch East Indies and French Indo-China. Future projected networks will link this country with Spain, Czechoslovakia and others.

Short-wave transmission and the

directive or beam systems are receiving increasing attention from communication engineers. While the Alexanderson alternators still shoulder their share of the overseas radio communication load, many short-wave channels have recently been opened. These have proved economical as well as productive of marked gains in speed. The peculiarity of the directive, or beam, system lies in the fact that the signals may to some degree be aimed directly at a distant receiving station, thus effecting a very considerable economy in the power required for spanning great distances.

Perhaps the most salient feature of present transoceanic circuits is their remarkable general efficiency. A few years back, a speed of 20 words per minute was considered highly creditable; yet today, in clearing radiogram traffic, improved short-wave circuits maintain speeds well in excess of 200 words per minute hour after hour, and automatic transmitters and receivers practically preclude the possibility of error by reducing the human element to an almost irreducible minimum.

### BROADCASTING

In the introduction, we referred to broadcasting as the "surprise party" of radio. Such a statement requires some explanation.

To begin with, the technical basis of broadcasting is the radiotelephone. This instrument was originally intended as a point-to-point communication means. For many years, experimenters had worked with the radiotelephone in the hope that it might eventually be developed as a rival of the wire telephone. Always, however, they had worked under difficulties.

Nevertheless, when put to a test, the radiotelephone at the time proved unsuitable for point-to-point communication because it lacked the vital element of secrecy. Those in charge of its development were forced to bow to the inescapable fact that traffic over the radiotelephone as developed up to that time was public property. And then it was that they decided to undertake a great experiment. The thought came to them that they might possibly make use of the fact that anyone who wished to listen in on a radiotelephone conversation might do so. Briefly, they decided to give mass telephony a trial.

Organized broadcasting made its début in the United States on November 2, 1920, when Westinghouse station KDKA transmitted bulletins on the result of the Presidential election contest of that year. Thus was born "The Pioneer Broadcasting Station of the World." From this humble beginning, there has developed our present vast broadcasting structure which comprises upwards of 700 stations and which is virtually a national institution.

It is not our intention here to give a detailed survey of the astonishing growth of broadcasting. Doubtless the reader himself has lived the story and is quite familiar with the fact that the KDKA station's lead was speedily followed by a host of other stations in all sections of the country. Indeed, for a short time, it seemed that there was no limit to the number of those who, for some reason or other, wished to broadcast. By August, 1924, a total of 1,105 stations had been licensed. Soon, however, various economic factors, heedlessly ignored by those who had rushed blindly into the new enterprise, began to exert an influence on the situation.

The economic factors were three in number. One was the crushing financial burden involved in the maintenance of a good broadcasting station. Few, if any, of the hundreds of those who were so anxious to "get on the air" had any conception of the factor which

they were soon to recognize as "the high cost of broadcasting." The second was the fact that the radio audience, now grown to enormous numbers, had also become discriminating, and completely reversing its attitude of the early days, looked to the broadcasters for a high class of entertainment service. The third was the fact that the smaller stations, although they had started with an apparently inexhaustible supply of program material, were now being hard pressed to hold the interest of their listeners in competition with the programs broadcast by leading stations in the great metropolitan centers.

It was at this point that the General Electric Company, the Westinghouse Electric and Manufacturing Company and the Radio Corporation of America decided to take a bold step. They realized that their commercial interests were bound up with the permanence of the idea and the institution of broadcasting. More than this, however, they appreciated their responsibility to the American public which had invested heavily in radio receiving equipment, believing broadcasting to be permanent. These three organizations, therefore, joined forces in the formation of the National Broadcasting Company in September, 1926, for the double purpose of supplying the two great perquisites of adequate financial strength and ample program material on a nation-wide scale.

The new company first purchased station WEAF, one of the leading stations, and made arrangements with the American Telephone and Telegraph Company for the lease of extensive wire line facilities to be used in broadcasting through a large group of scattered associated stations in a network. A short time after the formation of the National Broadcasting Company, the foundation of another network was laid when this organization took over the management and operation of stations WJZ and WRC from the Radio Corporation of America. A Pacific Coast network has also been formed, with programs radiating from the key stations in San Francisco. Now, 58 stations utilizing over 10,000 miles of especially engineered circuits are associated with the National Broadcasting Company's networks.

We have intimated that the question, "Who shall pay for broadcasting?" threatened for a time the foundations of the art. Fortunately, this problem is, today, well on the way to satisfactory solution. Our great manufacturing concerns saw in radio a national good-will medium of unlimited possibilities. These great commercial organizations, realizing that radio has become an invaluable supplementary force in public relations, have united with the broadcasters in the creation of the so-called "sponsored program." This institution has proved itself a blessing to all concerned. In it, the manufacturer has found a means of appealing to that tremendous purchasing power represented by the listening audience, and of establishing that goodwill which is so essential to the successful merchandising of any nationally advertised product. The broadcaster has discovered in it a means of achieving his long-cherished goal of financial independence. The listening public benefits in that it is assured of the highest possible grade of entertainment.

## THE FUTURE

Following in the wake of broadcasting has come the radio industry which, in a few short years, has developed into one of the most powerful in the country. Starting out, first as a laboratory experiment and later branching out as a commercial enterprise, it has, today, virtually hemmed us in on all sides

with signs of its manifold activities. Thousands of factories; hundreds of thousands of workers; millions of sets, parts, and accessories; thousands of retail outlets; an aggregate trade which, during 1928, will pass the half-billion dollar mark; and a broadcast audience grown to perhaps fifty millions—these are some of the concrete evidences that broadcasting is the young giant of American industry.

What of the future? Patrick Henry once said: "I know of but one lamp by which to guide my feet and that is the lamp of experience." If this is so, then we can see in the phenomenal development which has taken place within the last few years in marine radio, in transoceanic radio and in broadcasting but the small beginnings of the unparalleled expansion and growth which the future must inevitably bring.

Nor is radio destined to develop only along its three established lines of service. Indeed, the shadows of its new expansion have already been cast before it. It has gone afield and, coöperating with the phonograph industry in the perfection of electrical sound reproduction, has produced an instrument whose striking realism has given new life to that industry. Likewise, it has come to the aid of the motion picture industry and, giving it the "talking-movie," set its foot upon a path of development whose possibilities are limited only by the imagination.

And, to crown all, television, that branch of the radio art which will bring to our homes the visual as well as the aural record of stirring scenes and events, is already giving promise for the future so far as the laboratory is concerned.

# Radio Meteorological Services

By C. F. Marvin
Chief, United States Weather Bureau

THERE have been three stages in the development of existing methods of predicting weather from charts showing the meteorological conditions prevailing at a given moment over an extensive area of the earth's surface. In the first stage the results of observations taken simultaneously at various points were assembled months or years after the time of the observations and charted for the purpose of scientific investigation. This process was fruitful in revealing the fundamental facts regarding traveling weather systems that underlie present methods of forecasting, but was too slow to be utilized for practical purposes. The earliest synchronous weather charts of which we have any knowledge—those drawn by Brandes in 1820—were based on observations taken in the year 1783.

The second stage became possible with the advent of the electric telegraph, and became a fact soon after the middle of the nineteenth century. In this stage weather charts were drawn from telegraphic reports of observations, weather forecasts were made from the charts, and these announcements were disseminated by telegraph and otherwise; the whole process occupying only a few hours. Thus weather prediction becaem a practical art.

The third stage, after a number of experimental and small-scale undertakings during the early years of the present century, was definitely entered at the close of the World War. In this stage the radiotelegraph and the radiotelephone tend to become the main reliance of the meteorological organizations in collecting the information embodied in weather maps and in disseminating forecasts and warnings. Not only has radio greatly accelerated the interchange and diffusion of weather information, but it has brought within the sphere of these operations vessels on the high seas, craft navigating the air, and localities on land far outside the network of wire communication.

The radio meteorological service of today is essentially international in scope and character, and it tends to become world-wide. The interchange of weather reports between countries is under the general supervision of a body known as the Commission for Synoptic Weather Information appointed by the International Meteorological Committee. This body, which includes representatives from the principal meteorological services of the world, makes recommendations concerning hours of observation, contents of reports, hours of transmission and codes to be employed.

## Radiotelegraphic Weather Reports

The international system of radiotelegraphic weather reports has been standardized and systematized to a remarkable degree. According to a plan that was worked out at a conference held in Paris just after the war, the reports of observations in each country are assembled and broadcasted at prescribed hours in a collective message. The time-table now in force begins at Greenwich midnight with a broadcast from Julianehaab, giving the results of observations at that place and three others in Greenland. A similar broad-

cast from Greenland is made at Greenwich noon. The whole daily program calls for about 250 separate broadcasts of meteorological information in the countries of Europe and north Africa, together with Greenland, Iceland, the Azores and Syria. Though these emissions are spread over the twenty-four hours as well as practicable, it has been necessary in some cases to assign the same broadcasting time to three and even four stations. The use of different wave lengths prevents interference but complicates the problem of reception.

A majority of countries begin their meteorological broadcasts with the word "meteo" (or "météo"), and the messages themselves are now commonly called "meteograms." Though these broadcasts generally have certain fundamental features in common, some are much more comprehensive and elaborate than others. This statement applies both to the amount of information given for each weather station and to the number of stations whose reports are included in the broadcast.

In many cases a broadcast comprises reports from more than one country. Thus the daily broadcasts from Casablanca, Morocco, include reports from Algerian as well as Moroccan stations; also from the city of Tunis, and from ships on the western Mediterranean. Ismailia, Egypt, broadcasts reports from about 60 stations in Egypt, the Near East, northwestern Africa, the Mediterranean islands and the continent of Europe. More comprehensive broadcasts, known as "international collective messages," are issued by high-power stations at Paris, Hamburg, London and Leningrad, which contain reports from selected stations, not only in Europe, but also in various other parts of the world, including North America.

### RADIO WEATHER REPORTS

Though the United States Weather Bureau collects reports from its own stations and those of Canada by wire, the radiotelegraphic services of other countries furnish material for weather maps, drawn twice a day in Washington, extending far around the globe. Radio weather reports from the Far East are transmitted from Cavite, relayed from Midway Island and Honolulu to San Francisco, and thence forwarded by wire to Washington. Weather reports from ships on the Atlantic, Gulf, and Caribbean are radioed to Washington and San Francisco. The Weather Bureau broadcasts a number of collective bulletins of observations taken in the United States and elsewhere. These are mainly for the information of mariners, and are issued from more than 40 radio stations along the seacoasts and on the Great Lakes.

Special broadcasts are made twice daily from San Francisco and Washington on short-wave radio for the benefit of aviation. These broadcasts contain the coded weather reports received from all the stations in the United States and Canada, and are sent out as soon as received. In this way airports all over the country may procure the same early weather reports about as soon as they are received by the Weather Bureau itself.

Broadcasts by radio at San Francisco and Washington on twice-daily schedules provide marine and aviation interests with detailed coded and simple language bulletins. By means of these bulletins mariners may prepare their own weather maps at sea, and the forecasts and warnings are invaluable for careful and safe navigation of vessels. These bulletins, and especially the Washington bulletin, are well known to every radio ship operator on the Atlantic and Pacific.

The coming of the radiotelephone brought to the Weather Bureau a powerful means of disseminating weather information to the public. This information is of great value to those who live in the rural and greatly isolated districts of the land. Coming weather changes are announced by radio to these far-off people as quickly as they are distributed to the citizens of the great population centers by newspapers and mail. At the close of the year 1928, the Weather Bureau had the coöperation of nearly 200 radiophone stations which broadcast daily forecasts on regular schedules. No one, no matter where he may live, is beyond the range of some radiophone station broadcasting weather information for the region in question.

The people and meteorological services of Europe need weather reports from America. In order that they may be promptly furnished with such reports the Weather Bureau transmits twice each day a special coded bulletin by radio. This contains reports from about 50 selected places in Alaska, Canada and the United States. After broadcasting from Washington it is picked up in France and rebroadcast under renewed strength and power from the Eiffel Tower radio station in Paris for the benefit of all European weather services.

The radio services of the United States Weather Bureau are unknown to many, and few realize to what proportions this service has developed. The Weather Bureau, without owning a single transmitting station, has the coöperation of hundreds of radiophone and telegraph stations all over the country, in our island possessions, and in Alaska.

While the lands and seas of the Northern Hemisphere have now been linked up into a nearly coherent system of weather-reporting services, there is a much less general interchange of reports among the meteorological establishments of the Southern Hemisphere, and there is, as yet, very little exchange of current weather information between the two hemispheres. Brazil, Argentina, Uruguay, Chile, South Africa, Australia, New Zealand, Samoa and a few other regions in southern latitudes issue more or less comprehensive broadcasts of weather reports. A daily weather chart published in Buenos Aires tabulates data received by wire or radio from most countries of South America, and there is a daily telegraphic weather map of Australasia, published at Melbourne. Daily weather maps of the globe are well within the range of possibility, and this long-cherished dream of meteorologists bids fair to be realized within a few years.

# Radio and Safety

By C. B. Jolliffe

Physicist, Bureau of Standards; Technical Adviser to the American delegation to the International Radiotelegraph Conference of 1927

SINCE the first use of radio for communication purposes, the radio has been largely applied as an instrument of safety. In the past this has been chiefly in connection with the safety of ships at sea, but recently other applications have become of increasing importance. The importance of a means of communication for ships at sea is apparent. Radio is the only means of communication by which a ship can continually keep in contact with other ships or with stations on shore.

## Communication with Ships

It was early recognized that in order to make for maximum safety it was necessary that all ships equipped with radio be able to communicate with each other and with shore stations at any time. At first, to accomplish this, all operators when on duty listened on a common frequency. Five hundred kilocycles per second (600 meters) was chosen as this common frequency and in 1912 was accepted by international agreement as the calling and distress frequency.

When radio communication was used only occasionally by a few ships and with relatively low power, it was possible for all the ships equipped with radio to use the common frequency for all communications. As more ships were equipped with radio and communication became more complex, the common frequency became crowded and interference resulted. To eliminate this interference other frequencies were used for general communications and 500 kilocycles was kept open for distress messages and calling purposes, that is, for establishing contact for starting a communication. At the present time all ships which are required to be equipped with radio must, by international agreement, listen on 500 kilocycles for certain specified intervals. Thus any ship has a potential audience of all ships within range of its transmitter at certain periods of each hour.

## Distress Messages

The signal ···———··· (SOS) has been chosen as the distress signal, and international conventions have specified under what conditions and how this signal shall be sent, as well as how messages relating thereto shall be handled. The procedure is such as to insure that the information can be sent in a short space of time and be readily interpreted by all persons receiving it regardless of nationality. The distress signal and messages concerning it have absolute priority, and all radio stations which may cause interference with such traffic must stop sending immediately. Broadcasting stations along the coasts are frequently required to stop transmitting because of distress signals. Radio has been used frequently in bringing aid, thus saving a large number of lives and frequently the ships themselves.

## Automatic Alarm Signals

In the last two years there have been under development devices designed to respond automaticaly to a signal which

is used in addition to the distress signal. The International Radio Convention of Washington, 1927, specified the signal to which such a device must respond and the general requirements of operation which it must meet. The device must be such that it responds to the special signal and to no other. The automatic alarm devices ring several bells when the special signal is received; the radio operator can then adjust his set and get the messages pertaining to the distress call. On ships which do not carry a sufficient number of operators to maintain a continuous watch this device serves to furnish continuous listening on the distress frequency. When connected to an auxiliary receiving set it is also useful in providing continuous attention for distress calls while the operator on duty is carrying on regular communications on other frequencies. The devise is still in the experimental stage and is being tested under actual service conditions.

### AIDS TO MARINE NAVIGATION

While the use of the distress signal has been widely advertised, there are other uses of radio by ships which are nearly as valuable but much less spectacular. Many vessels now use a radio compass in addition to other navigating instruments. This instrument consists essentially of a coil antenna and receiving set. When a transmitting station is being received the coil antenna is turned until it gives no signal. The transmitting station is then in the direction at right angles to the plane of the coil. The apparatus has been developed to such an extent that in the hands of a person familiar with its operation it is as reliable a navigating instrument as the magnetic compass.

The Bureau of Lighthouses of the Department of Commerce has installed automatic radio beacon stations at certain of the lighthouses and light vessels. These beacons send out, intermittently in clear weather and continuously in bad weather, radio signals with a simple characteristic code. The code identifies the station, and lists are furnished giving the exact position of the stations. There are a large number of these beacon stations located along the Atlantic and Pacific coasts and on the Great Lakes, and more are being erected. To get his direction, the navigator tunes his receiving set to the proper frequency and then turns the coil until he gets a point of no signal, while a slight rotation in either direction brings in the signal. The position of the indicator then gives him the direction from which the signal is coming. When he has secured his direction with respect to two of these beacon stations, his position can be obtained by simple triangulation. In case radio beacon stations are not available, other shore stations or ship stations, the positions of which are known, may be used as radio beacons.

A radio beacon may be used as a course indicator in case the ship using a radio compass, is headed toward or away from it. In that case the course of the ship is kept in such a direction that the radio compass receives minimum signal when set with the indicator parallel to the axis of the ship.

In case a ship is in distress in bad weather, it may be difficult for the navigator to determine his position accurately, and so the position given along with the distress signal is often wrong. There have been several instances where a ship coming to the aid of another in distress has been unable to locate it at the position given. If the rescuing ship has a radio compass, it is only necessary for the ship in distress to send continuously; and by means of the radio compass the aiding ship can set its course and go directly toward the one in distress. This use

has been demonstrated repeatedly. In case of fog in busy ship lanes the radio compass can also be used to locate other ships and thus avoid collisions.

The United States Navy Department has established for its own use a somewhat similar system which it has made available to all ships. The Navy has located along the Atlantic and Pacific coasts a large number of radio compass stations on shore having the same type of radio compass as those on board ship. The stations are arranged in pairs, the two being located several miles apart, with one designated as the control station. In order to obtain its position a ship need only have a radio transmitting set. It calls the radio compass station and asks for its position. The two compass stations obtain the direction from which the transmissions come and then plot these directions on a chart. The position of the ship transmitting as thus ascertained is sent back to the ship by radio. The International Convention has designated 375 kilocycles (800 meters) as the frequency on which this service is to be given, protects this frequency from all other communications, and specifies the procedure by which the service shall be carried on.

Following the *Titanic* disaster the International Ice Patrol was established in the North Atlantic Ocean. At the season when icebergs begin to come into the shipping lanes of the North Atlantic the United States Government sends out ships to patrol the shipping lanes during the ice season and locate the icebergs. These patrol ships transmit by means of radio at definite times daily the position, rate and direction of drift, and any other pertinent information concerning icebergs which may come into the shipping lanes. This makes it possible for ships to alter their courses so as to avoid collisions.

Radio has also made possible an extension of medical service at sea. Many ships with relatively few men in the crew do not carry physicians. A definite procedure has been established whereby a ship without a physician may call one which has, and request medical advice. Treatment can thus be given to the sick under the direction of a physician.

### AIDS TO AIR NAVIGATION

With the increase in the use of aircraft the applications of radio to safety of airplanes in flight were investigated. Here the use is similar to use in marine work, as it is the only means of communication between airplane and ground and between airplanes in flight. Information concerning weather, landing facilities, etc., given to airplanes in flight enables them to make proper choice of courses and landing fields. The Department of Commerce is establishing radio transmitting stations along the civil airways and will broadcast to airplanes in flight information concerning the weather and other information of interest.

The limitation of the carrying capacity of small airplanes is such that it is not usually possible to put a radio compass on board the airplane. Because of this and other difficulties inherent in such an installation, directive radio beacons have been developed. These beacons mark out in space a definite course. On board the airplane it is only necessary to have a receiving set and either a pair of headphones or an indicator, depending on the type of directive beacon used. One type gives a continuous dash when the airplane is on its course; when the airplane deviates from its course it receives a signal which is broken up into separate dots and dashes. More recent developments make possible the use of a simple indicator located on the instrument board of the airplane. This

connects to the output of the receiving set. When the airplane is on its course, the indicator shows two white marks of equal length. When the airplane deviates from its course, one line becomes shorter and the other longer. In order to return to the course the pilot need only turn in the direction of the shorter line of the indicator. These directive beacons which are very reliable, are being installed on the civil airways.

Other radio aids to air navigation are under development. Among these are devices to assist a plane in landing, radio altimeters which give the height of an airplane above ground instead of above sea level, and field localizers.

### USE IN OTHER EMERGENCIES

Radio has also demonstrated its usefulness in case of emegencies. In time of great disasters, such as floods, hurricanes, etc., it is often the only means of communication with a stricken area. By means of radio, qualified persons in the stricken area are able to direct relief and give information concerning the distress.

In case of severe storms, when wire lines are broken down, radio provides means of emergency communication. it has been used by railroads for dispatching trains and by power companies for directing repair crews. Radio has been used by city police departments to direct their forces and also to broadcast information concerning criminals. This use was recognized by the International Radio Convention of Washington, in which provision was made for setting aside in Europe a frequency to be used only for the dissemination of information concerning criminals.

While the uses of radio are many, it is recognized by international treaty and by national law to be primarily useful as an agency for safety; and all other services must be arranged so as not to interfere with this major function. When new applications to safety are found, other services must yield to them.

# Radio in the American School System

By J. J. Tigert

President, University of Florida; until recently United States Commissioner of Education

TEN years ago the progressive school teacher gave a basket social and spelling bee to "raise money" to put a victrola into the schoolroom to be used for opening exercises, and the rudiments of music appreciation. Five years ago the up-to-date teacher gave a play, the proceeds from which supplied the school with a stereopticon lantern for visual instruction. This year, the modern rural school is installing a radio receiving set for use in a score of different ways, not only to supplement the work in the schoolroom, but to draw the community to the school as a center of interest.

And with radio about to bring sight as well as sound into those same schoolrooms, the possibilities for instructive value are more than doubled.

The schoolroom equipped with radio is not uncommon today, and while the larger cities expectedly have led with the installation of sets for experiment, many rural and consolidated schools have been quick to recognize their value.

Whether in their connection with elementary, secondary or higher education, educators, with few notable exceptions, declare their conviction that radio as a force in education will go much further in the future than it has progressed up to the present time. Most of the schools which have done anything with radio, either from the standpoint of broadcasting or receiving, label their efforts frankly as "experimental." But these experiments, as they take form more and more definitely, become increasingly valuable and interesting.

A questionnaire to state superintendents of public instruction in all states shows that New Jersey schools have installed the greatest percentage of receiving sets. Somewhat fewer than 50 per cent of the schools have sets, and the number is increasing rapidly. Nebraska apparently has the second largest number of receiving sets, placed at 25 per cent of the schools. In most other states, state superintendents replied that there were very few receiving sets used for instructional purposes, although the trend all over the United States is toward installation of sets, especially in the junior and senior high schools.

While the field of education, in its formal sense, has scarcely been touched by radio, most educators have very decided reactions as to its value—both present and future. The general concensus of opinion has it that while radio may be of use in the high school and even in the junior high school, it can be of little value in the first six grades.

Many educators go further, and declare that radio has no place in formal education, although all admit that its value as an entertainment and cultural feature is infinite. However, many would confine the efforts entirely to the home, restricting the field of the school entirely to the teacher. Mr. C. A. Howard, State Superintendent of Public Instruction of Oregon, declares that the "education of youth calls for self-activity" and places the big field of the radio in adult education.

"Radio in education has its greatest possibilities in the field of inspiration, interpretation, orientation and educa-

tional guidance," in the opinion of Dr. W. H. Lighty, Director of the Department of Extension Teaching of the University of Wisconsin, and Chairman of the Radio Committee of the National University Extension Association, which represents the largest state institutions in America. "It arouses and stimulates curiosity, breaking down error, prejudices and other evils through the broadening and illumination of men's horizons. It is this, rather than direct instruction, that is the big thing. Solid results in education are still as they always have been—a matter of achieving and not of receiving."

There are many other educators, however, who insist that the possibilities of the radio in formal education have only begun to be appreciated. The east and west coast states, especially their larger cities, desire only to be let alone. They are sufficient unto themselves, both in their superior teaching forces and in the material ordinarily used as supplementary. It is in the central and southern portions of the United States, where cultural resources are more limited, and where distances are great, that school administrators and teachers look to the radio for supplementary material in cultural and instructional fields.

### MUSIC INSTRUCTION BY RADIO POINTS THE WAY

America's ever moving frontier has always carried music with it. In colonial days, singing schools were common, often with no other instrumental accompaniment than a tuning fork. Westward bound, pioneers carried the wheezy organ to the homestead shanty. And, naturally enough, the universality of the taste for music, together with the ease of its adaptability for broadcasting, made it one of the first developments for popular radio entertainment. It was a perfectly logical step from there to the conception that people needed to be taught to understand music, since the so-called "musical population" has numbered about one per cent in the cities, and much less, of course, in country districts, where, before broadcasting made it possible, good music was almost never heard, except on the concert, lyceum and chautauqua stages. These agencies, replaced by the radio as a means of cultural entertainment superior in most ways, are undoubtedly declining.

Last year the Radio Corporation of America outlined three programs for music appreciation, which were broadcast by Walter Damrosch and his orchestra. The success was sweeping and this year a series of twenty-four educational orchestral concerts are being broadcast. Mr. Damrosch, himself, outlined the lessons, which are especially designed for particular grades, and include a definite study of instruments. A series of questions, with answers, sent out to teachers, supplements the program so that the teaching may be more adequate, and the results more definitely beneficial. Twenty-eight stations, the Blue Network and associated stations, are broadcasting the series during school hours. The radio audience for these orchestral concerts is estimated at twelve to fifteen millions of children of school age.

Damrosch said in a recent newspaper release:

> If I could bring the "little red schoolhouse" all over the country within the sphere of our activities, I should consider it the crowning arch of our building.
>
> I confidently hope that the proposed educational concerts will lay the foundation for a nation-wide perception and love of music among the youth of America, the like of which in its scope and importance has never been seen before.

The effort of the Radio Corporation of America at formal musical education is among the earliest which have been made. Although there is a great mass of material broadcast from the stations of the United States, both commercial and institutional, which may be called instructive and informative, little of it is what is called by the profession, "formal education." In other words, virtually none of the material is adapted to use in the classroom.

### "AGGIE" AUDIENCE BENEFITS BY INFORMAL BROADCAST

The service rendered their communities by the agricultural and mechanical college over the radio stations is probably the most definitely valuable of all educational efforts, whether the college is a part of the university or a separate institution. There are three main reasons for this. First, the type of information disseminated lends itself readily to informal lectures, which are immediately and practically usable, without a basis of college credit as consideration; second, the audience which is interested in this information is definite, numerous and comparatively stationary; third, certain features of the program, such as market reports and weather forecasts are so immediately necessary as to have actual monetary value to a great proportion of the audience.

The United States Department of Agriculture, by sending its timely printed material to the various broadcasting stations, assists appreciably in making the programs universal in appeal, while direct telegraph service to certain of them lends prestige and value to their programs.

Iowa, Kansas, Oregon and South Dakota are among the states whose agricultural colleges are broadcasting programs of a nature calculated to interest the farmer and certain groups of mechanical men, who may be held by lectures on subjects of concrete importance to their daily work.

### A LESS TANGIBLE FIELD IS OPEN TO UNIVERSITY STATIONS

The field of education which is covered, then, by the agricultural and mechanical college is concrete, and considerably more tangible in its entirety than that which must be covered by the university without the agricultural college. Some indicative facts concerning work at many of our universities and colleges are revealed in the following information, based on replies to questionnaires returned from these institutions.

The Ohio State University broadcasting station, WEAO, has built its service around the lecture, using it to form the backbone of every program. During the spring quarter this year, as a new feature, entire courses were broadcast directly from the classroom, giving the radio audience at first hand exactly what was going on in the classroom at the University.

The University of Iowa has offered some courses by extension over the radio, giving lectures once a week, with an examination at the end of the course. Alabama Polytechnic Institute broadcasts technical short courses as an educational feature, but did not regularly enroll students for them. The University of Minnesota, after attempting courses in foreign languages, has discontinued the practice. Many "listened in," it was found, but few enrolled and paid their fees. Again, reception was found to be too uncertain. Nebraska Wesleyan enrolled 130 students in the first formal course which it offered. Of these, 80 completed the course, and received certificates of award. Examinations were given on the honor system.

South Dakota State College, among

others, plans to offer a "college on the air" course this year, in which regular enrollment will be encouraged, and certificate awards made.

The double nature of the new State and University Station of Florida permits any informational material of the state departments to be broadcast, as well as the educational program of the university and other state institutions of higher learning, administered by the same Board of Control.

Very few colleges and universities which offer formal instruction (unless it is simply to supplement correspondence courses) approve of giving credit for work done, because they find that few students are able to follow the course through in its entirety. This certainly is due to some extent to uncertainty of reception; and usually when college credit is given for work done in radio courses, very complete check is kept by mail.

The general opinion of colleges and universities where there are broadcasting stations, however, is that informal lectures, without credit award, are still all that is suitable for radio instruction.

### UNIVERSITY-OWNED STATIONS

Virtually every college which has a broadcasting station considers its expenditure warranted. The budgets range from $25 to $12,000 a year. In the former case, however, the money from the college fund is supplemented by Chamber of Commerce donations. Usually the budgets appear pitifully small.

Money for maintenance of stations is frequently found in the budgets of the University Extension Divisions or Publici.y Departments. In some cases the radio station is maintained by a special radio fund, found in the university budget. Wherever the radio station fund may be found in university budgets, it appears to be insufficient to enable educational stations to compete with the commercial stations, because these stations are usually backed by big business for advertising purposes, or are selling advertising, which materially contributes to their support. Selling advertising is not yet considered ethical for the strictly university station.

Some of the college broadcasting stations have been gifts from friends or organizations. A few have been authorized by their states, and built with funds appropriated especially for that purpose. In rare instances, the colleges of engineering, extension divisions or publicity departments have had sufficiently generous budgets for building radio stations. In Florida the budget for both the building and maintenance of the State and University station was made entirely separate from the regular university appropriations, and seems to have many advantages as a result of this plan.

### UNIVERSITY PROGRAMS ON COMMERCIAL STATIONS

A number of prominent universities and colleges have broadcast their programs over borrowed commercial stations. This, however, has not always proved satisfactory, because the commercial stations themselves are sometimes so limited by the Radio Commission as to find it necessary to discontinue lending time.

One handicap which the educational station must consider, and which does not admit of easy solution, is that of the daylight broadcast. As the result of the study of the programs of twenty-seven leading broadcasting stations of the country, Mr. George H. Zehmer, Director of Extension of the University of Virginia, announced before the last meeting of the National University Extension Association:

It seems to be pretty generally conceded that the best radio hours for general educational programs are from around seven o'clock to nine or ten o'clock in the evening. A study of the programs submitted indicates that in many instances the value of these hours for purposes of education are largely disregarded in planning programs. The hours assigned advertising generally are the most desirable periods of the radio day. The educational talks which were given in the evenings during the periods indicated were obviously sandwiched in between most of the programs which were devoted to advertising.

Educational material is necessarily of restricted interest, and the more formal the lecture, the more limited is its scope. The only possible substitute is the so-called informal lecture, sugar-coated with a variety of scientific facts unusual enough, and yet common enough, to catch the interest and intrigue the imagination of the casual listener. Unfortunately, this handicap will continue, and will limit considerably the educational program of any station. No educational station, however ambitious and earnest may be its aim, will dare, under present conditions, to broadcast, any evening, an instructional program of more than an hour in length.

Recent decisions of the Federal Radio Commission handicap educational stations by daylight broadcasts, division of time, and undesirable wave lengths. Educators are chafing under this restraint, believing that big business has brought about the impression that the general university station cannot render a service distinct from that of the commercial station.

### USE IN THE PUBLIC SCHOOLS

The public schools of the country, despite the fact that the university and college stations have not been able to work out a definite, coöperative program of any magnitude for them, have, nevertheless, realized some of the possibilities of radio.

There is a surprisingly small number of high schools with broadcasting stations, usually operated in an effort to keep in touch with the school patrons. A few school systems have put in small sets for direct communication among its units, while a large number have receiving sets to pick up whatever the university and commercial stations can give them.

The experiment in radio instruction in the public schools of Oakland, California, yields most interesting and valuable information for the subject in hand.

About ten of the Oakland schools had radio sets installed for the project, two of the schools having a complete system of radio connected with all of the rooms.

The purpose, according to Mr. Virgil E. Dickson, director of the experiment, was

> to see if we could develop actual classroom instruction in which pupils in widely distributed centers of the city would participate. . . . To develop demonstration lessons for teachers to observe children in directed activities as nearly as possible parallel to regular classroom procedure. We wanted to know if anything approaching a common classroom lesson could be sent over the air to many classes at once.

As early as May, 1924, the committee began planning the work. The subjects selected for the first series of eight demonstration lessons of twenty minutes each, were English, counseling of classes going into high school, geography, literature, history, arithmetic, penmanship and physical training.

A member of the committee visited each schoolroom where students were participating in the lesson, to make observations. After each lesson, the committee compared notes and made

efforts to improve the next unit of the experiment.

The first trials were considered successful, and the work was continued in the fall, when a series of fifty-six lessons, covering vocational counseling, how to read a book, drawing, penmanship, science, singing, thrift, composition, arithmetic and manual activities were broadcast, and careful tabulation made of results. Each lesson was adapted for a particular grade, ranging from the fifth to the tenth.

It is perfectly possible to get reception so that a class of any reasonable size can hear every word and every direction of the instructor who is broadcasting, Mr. Dickson reports. It is also possible, he says, to plan a lesson that will interest, and keep active, any number of classes that have been properly prepared for its reception. The experiment proved that certain lessons taught before the microphone produce class and individual results that cannot be distinguished from those gained by the same instructor teaching in person before the class.

The replies to a recent questionnaire to educators in large school systems indicate that music appreciation and current events are popularly believed to be about the only subjects which are readily adapted to radio teaching. The Oakland experiment, however, shows, unexpectedly enough, that art and arithmetic are among the subjects which lend themselves most readily to successful treatment in radio lessons. These facts lead one irresistibly to the conclusions that radio instruction has not even begun to develop, and that subjects will not be restricted to the narrow fields which have generally been considered necessary.

Here, then, is the answer to those who maintain that formal education in the grades cannot be had by radio. Experiments such as the foregoing are bound to be supplemented in other parts of the country. The great difficulty to date has been that no one has given attention, first, to the scientific development of the lessons, and second, to the definite checking of results. It has been practically impossible to say whether formal education could be successful by radio, largely because most of the efforts at instruction have been purely informal. There seems to be no reason why radio instruction, too, should not be based on the "self-activity" necessary to the education of youth.

Benton High School at St. Joseph, Missouri, is equipped with apparatus under direct control of the principal. The central set is in the office of the principal, with a fifteen-inch loud speaker connection in each room. A microphone permits him to make announcements, and the teacher can reply by means of the loud speaker, which also acts as a microphone. There is a victrola attachment for playing records, which may be broadcast to any room at will.

The central set is tuned in at the principal's office, and at the proper moment, by the turn of a switch, all rooms are cut in on the program, with perfect reception for small groups, under teacher control, and with no loss of time.

At present, most high schools are not equipped with receiving sets because there is little material being broadcast during school hours which can be used to supplement the regular curriculum. School men state that when the college and university stations supply work of use to them, they will install radio receiving sets. However, until schools install the receiving sets and make it possible, universities and colleges probably cannot afford to put on an elaborate experimental educational program. The public schools and universities

must get together on a coöperative plan for satisfactory experimental work.

To assist in the promotion and development of radio in education, the college and university broadcasting stations have banded themselves together in an association, headed by Dr. Arthur M. Harding, Director of University Extension, University of Arkansas.

The purpose of this organization as expressed by its constitution is to "promote by mutual coöperation and united effort the best interests of those college and university stations which are members of the organization, to the end that both the technical and educational features of broadcasting may be properly safeguarded and extended."

The fact that the development of radio in education presents great difficulties certainly is no excuse for educators to evade their responsibility. Radio, as a present force in education, is an actuality. But, more important, radio, as a future force in education, is a potent possibility.

# The International Regulation of Radio in Time of Peace

By Irvin Stewart, Ph.D.

Associate Professor of Government, University of Texas; Technical Adviser to the American Delegation to the International Radiotelegraph Conference of 1927

THE fact that radio waves travel without regard to national boundaries makes international regulation indispensable. The chief reason for the earliest international regulation was not this characteristic, however, but the refusal of some radio companies to permit stations employing their apparatus to receive messages from stations employing competing systems. For instance, Marconi instruments were installed upon the condition that they should not be used to communicate with stations equipped with instruments of other manufacture. Even messages relating to obstructions to navigation were refused because of the wireless system employed by the stations sending the messages.

## The Preliminary Conference of 1903

As rivalry between private enterprises limited the usefulness of radio, the Governments concerned recognized the necessity of reaching an agreement relative to the principles upon which regulation should be based. A preliminary conference met in Berlin, August 4–13, 1903, to draft the basis of a convention to be submitted for the consideration of the various governments. Germany, Austria, Spain, United States, France, Great Britain, Hungary, Italy, and Russia were represented. All of the participating states, except Great Britain and Italy, favored the adoption of the principle that communication could not be refused solely because of differences in the wireless systems employed.

The Italian Government was bound to use the Marconi system exclusively for a period of years by a contract which prevented the adoption of the principle of intercommunication between systems. The Italian delegation vigorously opposed the adoption of that principle and as an alternative, proposed the temporary world-wide adoption of the best developed single wireless system—which was believed to be the Marconi system. Failing in the attempt to obtain the world-wide adoption of the Marconi system, the Italian delegation maintained that upon the adoption of the principle of intercommunication, provision should be made for the indemnity of existing wireless systems of high order. The British delegation opposed the requirement of indemnity but advocated a surcharge on messages exchanged with systems which had not reached the highest stage of development. The other delegations strenuously opposed both the indemnity and the surcharge, and no such arrangement was incorporated into the draft convention.

There was unanimous agreement that the convention should be limited to traffic exchanged between coast stations and ship stations. It was pointed out that the time was not ripe for the regulation of communication between coast stations and that communication between ship stations was of comparatively little importance and

would be exceedingly difficult of regulation.

The final protocol, as signed by all of the delegations except those of Great Britain and Italy, provided that coast stations open to general telegraph service were bound to receive and to send telegrams originating on or destined to ship stations without regard to the wireless system employed by the latter. Each government was to publish all technical information of a nature to facilitate communication between coast stations and ships at sea. A general basis for the determination of rates was laid down. Priority for distress calls was provided and provision made that the service of stations should be organized, so far as practicable, in such a manner as not to interfere with the service of other stations. Stations not open to general telegraph service were to be bound only by the provisions regarding distress and interference. Detailed provisions covering the exchange of traffic were to be provided in general regulations.

The British delegation made a general reservation, as well as specific reservations to those provisions requiring intercommunication regardless of system and requiring the service of stations not open to general telegraph service to be organized in such a manner as to minimize interference.

The Italian delegation signed a declaration stating that it could adopt the principle of intercommunication only as between systems of highest development. Reservation was also made on other clauses conflicting with the Marconi contract.

### THE BERLIN CONFERENCE, 1906

The final protocol signed at the preliminary conference served as the frame for a draft convention and regulations presented by the German Government as the basis for the deliberations of the International Conference concerning Wireless Telegraphy which opened in Berlin October 3, and closed November 3, 1906. Thirty states participated in the work of the conference.

Early in the proceedings, the British delegation provisionally accepted the principle of intercommunication between coast stations and ship stations without distinction of system.

The Italian delegation informed the conference that Italy was bound by the contract with Marconi but that the delegation would propose that Marconi be requested to agree to the modification of the contract where necessary or advantageous to facilitate international agreement.

The greater part of the convention adopted by the conference applied only to stations (coast stations and ship stations) open to public correspondence between the shore and ships at sea. British acceptance of the convention was obtained by the insertion of a provision in the final protocol that each government might designate certain coast stations exempt from the obligation to communicate regardless of system, on the condition that one or more coast stations, assuring a satisfactory service of public correspondence in the region, should be bound by the obligation. Eighteen of the twenty-seven states signing the convention stipulated in the final protocol that they did not avail themselves of this exception.

The United States delegation proposed to extend the obligation to communicate regardless of system to communications between ship stations open to the service of public correspondence. Considerable support was mustered for this proposition; but the British delegation stated flatly that it had been instructed not to sign the convention if such a provision were con-

tained therein. To meet the situation created by the position of the British delegation, the United States proposal was placed in an additional article, which was signed by all of the signatories of the convention with the exception of Great Britain, Italy, Japan, Mexico, Persia, and Portugal. That twenty-one states should agree in 1906 to a regulation thought undesirable in 1903 is an indication of the progress of radio in the interval.

The draft convention provided that each government should have a single vote in future radio conferences. In opposition to this provision, it was pointed out that in the administrative conferences of the Telegraph Union and of the Postal Union, each administration had one vote. Great Britain proposed that where different administrations pertained to the same government, each administration should be considered, upon request, as a country, provided that the number of votes at the disposal of a single government should not exceed seven. The proposal was supported by the assertion that it was to the advantage of the conference to have colonies adhere to the convention, and such adherence was doubtful if the colonies were not given the right to vote. The British proposition was opposed on the ground that the number of votes to be cast by a government should not depend upon the internal organization of that government.

The problem of voting was discussed for the entire conference. The provision finally adopted was that when a state adhered to the convention for its possessions, later conferences should decide whether the possessions, singly or together, should have a vote, with the maximum number of votes of a single government fixed at six. The final protocol outlined the procedure to be followed in requesting votes.

To facilitate the exchange of information relative to radio and to provide for the administrative work incident to international regulation, the International Bureau of the Telegraph Union was made a central office for radio.

The primary objects sought to be attained by the Berlin Convention were: (1) establishment of the principle of intercommunication without regard to system employed; (2) the greatest practical elimination of interference between stations; (3) opening of radio services to the public upon reasonable terms; and (4) adequate provision for the assistance of vessels in distress. These objects have persisted through subsequent conferences; changes have been directed largely toward means to achieve the desired objects rather than to the objects themselves.

The convention was completed by regulations containing detailed provisions designed to make it effective. As was to be expected, the development of radio caused these regulations to become antiquated while most of the basic convention articles continued satisfactory. The greater part of the proposals for amendment which confronted the International Radiotelegraph Conference of London, June 4–July 5, 1912, related to the regulations.

### THE LONDON CONFERENCE, 1912

The most important change in the convention made by the London Conference related to its scope. Due to changed conditions, Great Britain, Italy, and Japan announced early in the conference that they were prepared to accept the principle of intercommunication between ship stations regardless of system; and that principle was therefore embodied in the text of the 1912 convention. The convention was further enlarged to forbid

fixed stations (stations for service between fixed points) to refuse to exchange messages because of differences in system, though each country was left free in organizing the service and determining the correspondence of such stations.

As in the Berlin Conference, the most difficult non-technical problem confronting the London Conference was that of determining the basis of voting. Pursuant to the final protocol to the 1906 convention, Germany had claimed on behalf of its colonies, 3 votes; Belgium, 1; France, 5; Great Britain, 5; Japan, 1; Netherlands, 2; and Portugal, 2. These requests were granted by the conference. Requests made on the floor of the conference by the United States, Russia, Italy, and Turkey for additional votes were refused as not having been made in accordance with the provisions of the protocol.

After prolonged debate the matter of distribution of votes for the succeeding conference was finally decided at the session of July 3. Designated dominions, colonies, etc., were declared to be countries for the purposes of the application of the article on voting. Under the article as adopted, Germany, United States, France, British Empire, and Russia received 6 votes each; Italy, Netherlands, and Portugal 3 votes each; Belgium, Spain, and Japan, 2 votes each; and the remainder of the contracting states, 1 vote each.

The 1912 regulations differ extensively from those of 1906 in the attempt to keep pace with the development of radio.

At the time the London Convention and Regulations were adopted, it was expected that a conference to be held in Washington in 1917 would continue the process of development. But 1917 found the world at war; and it was not until 1927 that the Washington Conference met.

## THE SAFETY OF LIFE AT SEA AND AIR NAVIGATION CONVENTIONS

Between the London and Washington Conferences there were two other conferences whose labors involved some regulation of radiotelegraphy. The first of these was the International Conference on Safety of Life at Sea, as a result of whose labors the International Convention for the Safety of Life at Sea was signed on January 20, 1914. That conference discharged a duty to which the 1912 conference had found itself incompetent in imposing the obligation to install radio equipment on vessels of certain categories. The radio provisions of the Safety of Life at Sea Convention were closely interrelated to the relevant parts of the London Radio Convention. The regulations annexed to the convention contain detailed provisions relating to the part to be played by radio in the safety of navigation. The international conference to be held in London in 1929 to revise the Safety of Life at Sea Convention will doubtless make the radio provisions of that convention and regulations responsive to the provisions of the most recent radio convention and regulations.

The Convention for the Regulation of Aerial Navigation signed at Paris October 13, 1919, provides for the licensing of radio apparatus carried on aircraft and lays the foundation for a requirement compelling certain types of aircraft to be fitted with radio apparatus. The radio provisions of the convention and annexed regulations are not nearly so detailed as are those of the Safety of Life at Sea Convention.

## THE WASHINGTON CONFERENCE, 1927

The scope of the convention drafted by the International Radiotelegraph Conference which met in Washington, October 4–November 25, 1927, is

wider than that of the preceding conventions. Its provisions are designed to apply to all radio communication stations open to the international service of public correspondence. In addition to the stations covered by the London Convention this includes aircraft stations and stations engaged in communication service between countries. The convention, which had seventy-eight signatories, became effective January 1, 1929.

The standards set in the new convention are higher than those in the earlier ones, responding to the advance in the radio art. Stations covered by the convention must, so far as practicable, be established and operated under the best conditions known to the practice of the service and must be maintained abreast of scientific and technical progress.

As in the two preceding radio conferences, the determination of the basis of voting caused great difficulty. The principle of multiple votes was challenged by a number of delegations at Washington; at the same time the number of countries demanding multiple votes was greatly increased. Unable to solve the problem, the conference passed it to the foreign offices by omitting all mention of votes from the convention. It is hoped that the solution will be reached through diplomatic negotiations before the next conference meets in Madrid in 1932.

The Washington Convention is accompanied by two sets of regulations: general regulations containing provisions for carrying the convention into effect, and supplementary regulations, containing additional material to which the United States, Canada and Honduras could not subscribe. The supplementary regulations deal largely with rates, the relation between the Radio Convention and the Telegraph Convention, and procedure in radiotelephony.

The general regulations contain a thorough revision of the London Regulations, to bring them abreast of the radio art without stifling future progress. In several major respects they differ from the London Regulations: for the first time there is an allocation of frequencies to types of service; there is definite provision for the regulation of radio service with aircraft; provision is made for the eventual prohibition of the use of damped wave apparatus; special services are defined and regulated to a greater extent than before; the rights of amateurs are recognized; the basis is laid for the regulation of radiotelephony; and provision is made for an International Technical Consulting Committee of a purely advisory character.

The most serious danger involved in the international regulation of radio is that some conference may indulge in a type of regulation which will hamper the progress of the art. Thus far, the danger has been recognized, and ample freedom has been left for development. Should some future conference so far forget the proper scope of its labors as to depart from this practice, the result must inevitably be chaos.

# The Division of Radio Services of the International Bureau of the Telegraph Union *

By Ernest Rusillon

Secretary, International Bureau of the Telegraph Union

THE International Telegraph Union has maintained since 1868 a central office, the "International Bureau of the Telegraph Union," with its seat at Berne, under the authority of the chief administration of the Swiss Confederation. This bureau is charged with the duty of collecting, combining and publishing information of every kind relative to international telegraphy, of circulating in due form requests for modifications of the tariffs and service regulations annexed to the international telegraph convention, of announcing the changes adopted, and, in general, of undertaking all the studies and carrying out all the tasks assigned to it in the interests of international telegraphy.

## Draft of 1906

The draft of the International Radiotelegraph Convention of Berlin, 1906, provided likewise for the creation of an international bureau having, for radiotelegraphy, duties similar to those of the International Bureau of the Telegraph Union. The Berlin Conference of 1906 taking into consideration the fact that the radiotelegraph service is, in the final analysis, only an extension of the telegraph service, and that it would be more economical to attach the new central organ to the already existing Bureau, adopted the following solution:

> The International Bureau of Telegraphs [the present International Bureau of the Telegraph Union] shall be entrusted with the duties specified in Article 13 of the Convention, subject to the consent of the Government of the Swiss Confederation and the approval of the Telegraph Union.

(The duties outlined are similar to those of the central organ of the telegraph union.)

The consent of the Swiss Government and the approval of the Telegraph Union having been obtained, the new organ was attached to the International Bureau of the Telegraph Union and began to function early in 1907, *i.e.*, before the coming into force of the Berlin Convention of 1906—set for July, 1908—in conformity with the desire of the conference which had instituted it. Today it is the organ of the 105 parties to the international radiotelegraph convention.

## Duties and Activities

The Washington Convention, which became effective January 1, 1929, defines the rôle of the central office as follows:

> Art. 16, §1. The International Bureau of the Telegraph Union shall be charged with collecting, coördinating, and publishing information of all kinds relative to radio services, with examining the requests for changes in the Convention and the Regulations annexed thereto, with promulgating the amendments adopted, and generally with performing all administrative tasks with which it shall have been charged in the interest of international radio services.

* Translated from the original French by the editor of this volume.

As a matter of fact, the International Bureau may not examine requests for changes in the international radiotelegraph convention and regulations as the question of the right to vote was not settled at Washington.

The greater part of the duties of the central office are stipulated in detail in the general regulations annexed to the Washington Convention. They are chiefly the following, having varied little since the beginning:

The International Bureau prepares for the radiotelegraph conferences by assembling, translating where necessary, coördinating and publishing the proposals which administrations and companies desire to submit to these conferences. Ordinarily acting as the Secretariat General of the conferences, it prepares the *procès verbaux* of the plenary sessions and provides for their printing as well as that of the reports of the various committees. It publishes, after each conference, the collection of its documents, as well as the convention and regulations. The Director of the Bureau assists in the sessions of the conferences and takes part in debates, but without the right to vote.

The bureau is called upon for its opinion on questions of interpretation of the radiotelegraph convention and regulations, but the opinion is not binding upon the parties.

It publishes the following documents:

(a) Nomenclatures of all fixed, land and mobile stations having a call signal from the international series, whether or not open to public correspondence, as well as a nomenclature of broadcasting stations.

(b) An alphabetical list of call signals of all fixed, land and mobile stations assigned a call signal from the international series.

(c) Notices and information for the use of central administrations.

(d) A table and a chart indicating the zones and the hours of service of ships not operating a continuous radio service.

(e) General statistics relating to radiotelegraphy.

(f) Opinions issued by the International Technical Consulting Committee on Radio Communications.

(g) Charts of radiotelegraph stations.

All of these documents are sold to administrations, companies and individuals at cost.

Moreover, the bureau collaborates in the publication of the *Telegraph Journal* established by the international telegraph service regulations. In addition, it makes an annual report of its activities which is communicated to the administrations of states parties to the International Radiotelegraph Convention.

## EXPENSES

The expenses resulting from these activities are borne by all the contracting governments. In the apportionment of expenses, the governments are divided into six classes, each contributing in proportion to a certain number of units, as follows:

| | |
|---|---|
| First class | 25 units |
| Second class | 20 units |
| Third class | 15 units |
| Fourth class | 10 units |
| Fifth class | 5 units |
| Sixth class | 3 units |

The administrations inform the International Bureau of the class in which they wish their countries to be placed.

The coefficients above are multiplied for each class by the number of states in the class, and the sum of the products thus obtained furnishes the number by which the total expense must be divided, to determine the amount of the unit of expense.

The expenses of the International Bureau resulting from the radio service

must not exceed 200,000 gold francs per annum, not including expenses pertaining to the work of conferences and expenses pertaining to the work of regularly constituted committees when, according to the provisions of the general regulations or the decision of a conference, these expenses are to be borne by all of the contracting states.

The chief administration of the Swiss Confederation is charged with the organization of the Division of Radio Services of the International Bureau; it exercises supervision over the division, controls its expenses, makes necessary advances and makes the annual accounting. This accounting is communicated to all of the other administrations.

The accounts of the International Bureau as well as the reports of its activities, are also submitted for the approval of the conferences.

As a matter of information, the following table gives for several years the amount of the expenses of the central organ, to which was allocated a credit of 40,000 gold francs at first—a credit which was increased to 80,000 gold francs in London in 1912. These figures do not include expenses pertaining to the conferences.

| | |
|---|---|
| 1907 | 4,018 francs |
| 1910 | 19,620 francs |
| 1915 | 66,450 francs |
| 1920 | 75,416 francs |
| 1925 | 136,444 francs |
| 1926 | 146,577 francs |
| 1927 | 161,340 francs |

The personnel, under the authority of a single director for telegraph and radio, comprises for the latter service a vice-director, a secretary and three other officials. In addition, the two services use four agents in common. Supplementary assistance is engaged whenever need for it arises.

# Army Radio in Peace and War

By William R. Blair
Major, Signal Corps, United States Army

IN his annual report for the fiscal year 1897 and 1898, the Chief Signal Officer, General A. W. Greely, makes the following statements:

The policy pursued in the past by the Chief Signal Officer in experimental work along lines of prospective value to the Army has naturally been interrupted by the war. Nevertheless, it has progressed as far as existing conditions have permitted. Colonel James Allen has devoted much attention to the system of wireless telegraphy with a view to adopting a suitable system whenever the progress of invention and the conditions of the military service shall warrant such progress.

## Experimental Communication

The following year experimental communication by "wireless" was established by the Signal Corps of the Army between Fire Island and Fire Island Light Ship, a distance of 12 miles. In April, 1900, radio stations were installed by the Army at Governor's Island and at Fort Hamilton, and a daily communication schedule established. Later in 1900 a similar radio circuit was put in operation between Fort Mason and Fort Alcatraz, San Francisco Harbor. These installations were made under the direction of Lieut.-Col. James Allen and Capt. George O. Squier, each of whom later became Chief Signal Officer of the Army.

Difficulty was experienced by the Signal Corps in maintaining its submarine cable across Norton Sound between Nome and St. Michael. This cable, which formed part of the Alaskan Telegraph System, was invariably carried away when the ice broke up in the spring. Because of the success of the radio circuits established in the New York and San Francisco Harbors it was decided to employ radio in place of this cable. A contract was let for the required radio installations, but the contractor was unsuccessful. In the later part of 1902 the Signal Corps undertook to make these installations itself and in August, 1903, the system was placed in successful operation. This is one of the first long distance radio circuits to regularly handle commercial telegraph business. The distance between the two stations is approximately 110 miles.

## Rapid Increase

The use of radio by the Army for communication between fixed stations and between ship and shore stations increased rapidly, so that by 1912 there were in operation by the Army 36 fixed stations and 26 ship stations, the latter distributed as follows: 14 transports, 3 cable ships, and 9 Coast Artillery tugs. The fixed stations ranged in power from one to ten kilowatts and were located in the United States, Alaska, Cuba and the Philippine Islands.

At the present time the Army is operating a total of 208 radio stations, 107 of which are fixed stations located at Army establishments throughout the United States, the foreign departments and China. Thirty-three are fixed stations of the Alaskan Communication System maintained by the Army. Sixty-eight are ship stations. The Army carries on practically all types of radio communication over the cir-

cuits established by means of these stations, including point to point, ship to shore, ground to plane, intership and interplane communication. Army stations are equipped to operate on low, intermediate or high frequency, depending on the length and type of circuits established.

### ARMY DEVELOPMENT OF RADIO COMMUNICATION

These Army radio stations not only provide means of essential communication between Army posts including channels of command throughout the Army, but they serve as a laboratory in which radio equipment, personnel and methods of procedure may be tested and improved. It has also occurred on a number of occasions when interruption of wire communication resulted from floods, storms, or other unusual phenomena, that Army radio circuits have supplied the much needed communication facilities. Within the past year or two such essential service has been rendered in the region of the lower Mississippi, Omaha, New England and in Florida. Army radio circuits are also made available to other Government departments. It is estimated that approximately 40 per cent of the traffic handled on these circuits originate in other departments of the Government.

From the earliest time the Army has been a pioneer in the development of radio as a means of communication, and more especially in the development of radio equipment for use by military forces in the field. The design of field radio equipment is complicated by the fact that such equipment must be portable, the more easily portable the better. It was not until 1906 that the first successful field radio equipment was built. Two types of portable stations were designed: a wagon set and a pack set that could be carried on three animals. By 1908 the Army was well supplied with these radio sets and had tested them under actual combat conditions in Cuba and in the Philippine Islands. These first portable sets were of the induction coil type. They were soon abandoned for quenched gap spark sets operated by 500-cycle alternators. The spark type of installation was adopted in 1911. The pack and wagon sets continued to be the two types of portable Army radio equipment until our entry into the World War.

During the World War there was intensive development along all lines that appeared to make for the success of armies in the field. Radio was not overlooked in this development. The armies of all powers involved, our own included, were quick to recognize its value and to expend funds and energy lavishly in scientific radio research. One of the biggest improvements which resulted was the design of more sensitive receivers by using vacuum tube detectors and amplifiers. Another was the development of the transmitting vacuum tube and the design of vacuum tube transmitters. The two types of portable equipment heretofore employed by the Army were no longer adequate, either from a tactical point of view or as radio apparatus. The tactical use of radio lead to the equipment of smaller tactical units with low-powered, short-range sets, the next larger units were given sets somewhat higher powered and longer range and so on. Radio for aircraft was designed and came into general use. The need for many types of radio sets became apparent.

### LABORATORY WORK

The research organization set up by the Army during the war included radio laboratories at Camp Alfred Vail, now Fort Monmouth, N. J., the Signal

Corps Laboratory at the Bureau of Standards, and the laboratories and Field Test Section of the American Expeditionary Forces. The work of these laboratories was, of course, supplemented by commercial companies working under contract. A rather comprehensive program of research and development was carried out by this organization. Many improvements were made to available radio equipment and much new equipment was designed. The Armistice found us near the completion of the program which included a series of radio sets specially designed to meet the requirements of our Army. The time was so short, however, that very little of this new equipment had at that time been produced and placed in the hands of troops.

During the demobilization period, research and development work in radio as well as along other lines practically ceased. The war experience had, however, clearly demonstrated the possibilities of radio as a means of communication between headquarters in the field as well as the need for continued research and development in order to keep pace with progress in the radio art.

The design of radio equipment for use by troops in the field presents problems very different from those encountered in the design of fixed station or ship radio equipment. The requirements of portability, ruggedness, power and range limitations, are peculiar to their military use. This, together with the fact that the amount of such equipment needed by the Army in time of peace is small from the point of view of commercial production, hardly justifies commercial companies in voluntarily undertaking the design and development of such equipment. It seemed wise, therefore, to continue the Signal Corps Radio Laboratory at Fort Monmouth, N. J. In addition to the Fort Monmouth Laboratory, the Signal Corps Aircraft Radio Laboratory at Wright Field, Dayton, Ohio, has been organized especially for the design of radio equipment for use on and by aircraft. This laboratory has been located at Wright Field because of the facilities afforded there for the testing of new equipment. An important adjunct of the Signal Corps Aircraft Radio Laboratory is its flying laboratory. The flying laboratory is installed in a three-motored cabin plane which affords plenty of space for flight tests of experimental layouts of all types of radio and auxiliary equipment needed on planes.

These laboratories make a continuous study of all radio equipment in use in the Army with a view to its improvement as the art progresses, in addition to keeping efficient modern radio equipment in the hands of troops. Much of the results of radio development in the Army is available for civil or commercial use. Among these by-products of military radio development, two or three may be mentioned as indicative of the value of the research work done by the Signal Corps of the Army to the radio art in general. During the war development was begun on a very light portable high frequency radio set for use by lower units in the field. The development of this set was soon successfully completed in the laboratory at Fort Monmouth and shortly afterwards put in the hands of troops. This is one of the first pieces of practical high frequency radio equipment working above 4,000 Kcs. This, together with the early work of Army radio personnel in the high frequency field, contributed greatly to the progress of high frequency radio. Radio equipment for use on airplanes developed by the Army has been given careful consideration both by the Depart-

ment of Commerce and by commercial companies as a basis for the equipment of planes flying the civil airways. The SCR-134, a combined telegraph and telephone transmitting and receiving set, has been found especially adaptable to commercial use.

The equi-signal radio beacons installed by the Signal Corps of the Army at Crissy Field and in the Hawaiian Islands were placed at the service of the participants in the Dole flight from San Francisco to the Hawaiian Islands and were employed by Mr. Goebel throughout his flight. It is an interesting fact that of the two planes completing the course, the slower plane following the great circle course marked by the Army beacon was the first to reach the Hawaiian Islands. This type of beacon is the result of a number of years' research and development work in the Signal Corps Aircraft Radio Laboratories at McCook and at Wright Fields near Dayton, Ohio. The Department of Commerce has had a number of these Signal Corps radio beacons built and installed on commercial airways as aids to air navigation. Other illustrations might be given of how the results of radio research and development by the Army have been made available for civil and commercial use.

Much improvement in radio equipment and method of operation still remains to be made in order to get maximum communication efficiency in the use of the radio spectrum. Recognizing this, the Signal Corps of the Army is continuing to maintain and improve its research and engineering laboratory facilities. The fact that many of the problems involved are physical rather than engineering has lead to the recent establishment of a physical research section in the laboratories. The effect of the work of this section in the general laboratory output is already making itself felt.

# Naval Radiotelegraph in Peace and War

By Captain S. C. Hooper[1]

United States Navy, Director of Naval Communications; Technical Advisor to the American Delegation to the International Radiotelegraph Conference of 1927

IN handling the subject I will divide the article into two parts. The first will be a brief discussion of the application of radio to the Navy. In this part the treatment will be based on the United States Navy, although it can be understood that in its essentials it applies to any navy. The second part will contain a review of international law as it exists with respect to radio.

## Functions and Service

Naval radio functions under the Naval Communication Service. Its activities are coördinated with those of other departments of the Government by the Interdepartment Radio Advisory Board and conform to the International Radiotelegraph Convention of 1927, of which the United States is a member. In this connection I draw attention to Article 22 of this Convention. This article allows the contracting governments

> entire liberty regarding radio installations not covered in Article 1, and especially with reference to Naval and Military installations.

The article directs compliance, in so far as practicable, with regard to help in cases of distress, and regarding types of waves and frequencies to be used and measures to prevent interference. It will be seen that the convention recognized the importance of radio to the national defense and did not attempt to regulate its use for this purpose.

The Naval Communication Service carries out the Navy's communication policies:

(a) To maintain and operate a naval communication system based on the requirements of the forces afloat in a campaign in either or both oceans.

(b) To provide adequate radio communication facilities to mariners along the United States coasts where privately-owned facilities are not made available.

(c) To promote harmony and cooperation between naval radio systems and all other radio systems, and to define the areas of their activities.

(d) To watch and guard the radio and cable interests of the United States.

(e) To provide and operate radiocompass stations as required.

(f) To develop and coördinate all systems and methods of communication required for battle efficiency.

(g) To develop within the fleet, the uses of all forms of communication required for battle efficiency.

(h) To use the naval radio communication system in time of peace to assist in the development of American interests abroad.

The supply of material satisfactory to meet the Navy's requirements is a complex and difficult technical problem. Intrafleet communication demands the simultaneous use aboard ship of several frequencies. High powers must be handled with limited antenna characteristics available. Ashore, the power needs and necessity of avoiding interference with other services make an equal demand on apparatus. To obtain material to meet its requirements

[1] Lt. A. T. Sprague, U. S. Navy, assisted in the preparation of the present article.

the United States Navy has always been in the forefront of radio research and has contributed greatly to the progress of the art. It has maintained its own laboratories and has coöperated to the greatest extent with commercial research.

The extremely high standards set by naval specifications for material have in themselves aided progress in design, and the rapid progress made in the radio art in the last few years has been in no small part due to development work in fulfillment of these specifications.

Organization within the fleet and equipment aboard ship is maintained and operated in time of peace adequate for war-time needs. The shore establishment maintained is adequate for peace-time needs, and contemplates that the Navy assumes control of such non-military R/T stations as may be allocated to it by the President to augment its facilities for war. Such was the case during the World War when the Army and the Navy assumed control over all R/T stations during the period of hostilities.

Mention has been made above with regard to the main function of the peace-time Navy—preparation for war. This is a purely military function and is prosecuted to the limits of the Navy's ability. In addition to this, a very considerable service is rendered by naval radio to other departments of the Government and to the country at large, in addition to the indirect benefits conferred by progress in technical development:

1. Use by other departments of the Government of Naval Communication Service for transaction of Government business.

2. Time signals.

3. Weather broadcast to *all* ships.

4. Use of Navy shore stations by commercial shipping where private companies do not offer adequate service. This includes maintenance of their facilities at points where service would otherwise be unavailable.

5. Maintenance of radio compass on our seacoasts, the facilities of which are extended gratuitously to all shipping.

6. Use of transpacific circuit by press associations, etc., for press dispatches to Hawaii and Far East.

### COMMISSION OF JURISTS

At the Conference on the Limitation of Armaments at Washington, the powers then represented adopted a resolution for the appointment of a commission representing the United States, Great Britain, France, Italy and Japan to consider:

(a) Do existing rules of international law adequately cover new methods of attack or defence resulting from the introduction or development, since the Hague Conference of 1907, of new agencies of warfare?

(b) If not so, what changes in the existing rules ought to be adopted in consequence thereof as a part of the law of nations?

The above commission met at the Hague 1922–1923. At the unanimous invitation of these powers, the Government of the Netherlands was invited to participate and accepted.

This commission of jurists adopted as a part of its work a set of rules for the control of radio in time of war. In its deliberations, due consideration was given to existing pacts in which the control of radiotelegraph was mentioned. Among them were:

1. Land War Neutrality Convention —No. V of 1907.

2. Convention for the Adoption of the Geneva Convention.

3. Convention Covering Neutral Rights and Duties—No. XIII of 1907.

4. Declaration of London, 1909.

5. Convention of Safety of Life at Sea, 1914.

The rules recommended follow:

Article 1. In time of war the working of radio stations shall continue to be organized, as far as possible, in such manner as not to disturb the services of other radio stations. This provision does not apply as between the radio stations of opposing belligerents.

Article 2. Belligerent and neutral powers may regulate or prohibit the operation of radio stations within their jurisdiction.

Article 3. The erection or operation by a belligerent Power or its agents of radio stations within neutral jurisdiction constitutes a violation of neutrality on the part of such belligerent as well as on the part of the neutral Power which permits the erection or operation of such stations.

Article 4. A neutral Power is not called upon to restrict or prohibit the use of radio stations which are located within its jurisdiction, except so far as may be necessary to prevent the transmission of information destined for a belligerent concerning military forces or military operations and except as prescribed by Article 5.

All restrictive or prohibitive measures taken by a neutral Power shall be applied impartially by it to the belligerents.

Article 5. Belligerent mobile radio stations are bound within the jurisdiction of a neutral state to abstain from all use of their radio apparatus. Neutral governments are bound to employ the means at their disposal to prevent such use.

Article 6. 1. The transmission by radio by a vessel or an aircraft, whether enemy or neutral, when on or over the high seas of military intelligence for the immediate use of a belligerent is to be deemed a hostile act and will render the vessel or aircraft liable to be fired on.

2. A neutral vessel or neutral aircraft which transmits, when on or over the high seas, information destined for a belligerent concerning military operations or military forces shall be liable to capture. The Prize Court may condemn the vessel or aircraft if it considered that the circumstances justify condemnation.

3. Liability to capture of a neutral vessel or aircraft on account of the acts referred to in paragraphs (1) and (2) is not extinguished by the conclusion of the voyage or flight on which the vessel or aircraft was engaged at the time, but shall subsist for a period of one year after the act complained of.

Article 7. In case a belligerent commanding officer considers that the success of the operation in which he is engaged may be prejudiced by the presence of vessels or aircraft equipped with radio installations in the immediate vicinity of his armed forces or by the use of such installations therein he may order neutral vessels or neutral aircraft on or over the high seas:

1. To alter their course to such an extent as will be necessary to prevent their approaching the armed forces operating under his command.

2. Not to make use of their radio-transmitting apparatus while in the immediate vicinity of such forces.

3. A neutral vessel or neutral aircraft, which does not conform to such direction of which it has had notice, exposes itself to the risk of being fired upon. It will also be liable to capture, and may be condemned if the Prize Court considers that the circumstances justify condemnation.

Article 8. Neutral mobile radio stations shall refrain from keeping any record of radio messages received from belligerent military radio stations, unless such messages are addressed to themselves.

Violation of this rule will justify the removal by the belligerent of the records of such intercepted messages.

Article 9. Belligerents are under obligation to comply with the provisions of international conventions in regard to distress signals and distress messages so far as their military operations permit.

Article 10. The perversion of radio distress signals and distress messages prescribed by international conventions to other than their normal and legitimate purposes constitutes a violation of the laws of war and renders the perpetrators personally responsible under international law.

Article 11. Acts not otherwise constituting espionage are not espionage by reason of their involving violation of these rules.

Article 12. Radio operators incur no personal responsibility from the mere fact of carrying out the orders which they receive in the performance of their duties as operators.

### EFFECT OF RULES

The background of these rules will be discussed briefly and their influence shown:

Article 1. Article 10 of the International Radiotelegraph Convention of 1927 provides that the operation of radiotelegraph stations must be organized, in so far as possible, not to disturb service of other stations. Article 1 makes this applicable during time of war except between belligerents.

Article 2. This article similarly extends Article 15 of the 1927 Convention to time of war.

Article 3. An adaptation of Articles 3 and 5 of the Land Warfare Neutrality Convention. It is to be noted that the neutral state is bound to use the means at its disposal to prevent breach of neutrality under the article.

Article 4. Covers the same ground as Articles 8 and 9 of Land War Neutrality Convention, adding to the neutral the duty of prevention of transmission by radiotelegraph of information destined for belligerents covering military forces or military operations.

Neutral restriction to be applied to all belligerents impartially. This article does not render necessary a censorship in every neutral country during every war. The character of the war and the position of neutral may render this unnecessary. However, a neutral government is bound to use the means at its disposal adequately to comply with this article.

Article 5 in enacting a continuation during war is in harmony with the Convention Concerning Rights and Duties of Neutral Powers in Maritime Warfare.

Many of the Powers, notably those represented on the Commission of Jurists, prohibit use of radiotelegraph on vessels within their jurisdiction.

Article 6. The transmission of military intelligence for the benefit of a belligerent constitutes an active participation in hostilities and, therefore, merchant vessels or aircraft in so doing immediately lose their non-combatant status and its immunities. Members of crew or passengers, if implicated, are regarded as having committed an act in violation of the laws of war.

Extending the liability of capture beyond the immediate voyage and for a period of a year takes into account the time necessary in some cases to establish a case, such as the examination of message logs of a great many vessels or aircraft.

It will be noted that this article imposes no obligation on the neutral government inasmuch as its control over a mobile station on the high seas is not immediate.

Article 7. This article essentially supplements Article 6. In addition to any question of the acquisition by the enemy of information, the use of their radiotelegraph by merchant ships or aircraft might well be a great embarrassment to a fleet commander because of the interference occasioned his communications. He is, therefore, given power to warn merchant vessels and private aircraft away from the scene or to impose radiotelegraph silence if they are within the theatre of operations.

This article presupposes the actual presence of naval or aerial force engaged in operations and intends that the powers given be limited to the actual duration of operations. Powers herein granted are not applicable to widely extended zones.

The terms in which this article, and

also Articles 6 and 8, is drafted would cover neutral public vessels or aircraft. No intention to encroach upon the rights of neutral states is implied. It is assumed no such neutral public vessels would attempt to interfere with the operations of a belligerent.

Article 8. This article is aimed to avoid the eventuality of one belligerent acquiring information by finding in the radio log of a neutral vessel copies of the other belligerent's dispatches.

Examination of that portion of the offender's log would attract attention of the offender's administrative agent to his violation of this article.

Articles 9 and 10. These articles are self-explanatory.

Article 11. The purpose of this article is to show clearly that the question of whether an act in violation of these rules is also espionage cannot be answered except by reference to those provisions of international law defining espionage.

Article 12. This article was included to clarify the position of the actual operator and not render him liable for acts committed in execution of orders from his superiors.

The Land Warfare Regulations and Naval Bombardment Convention of 1907 permit the bombardment of coastal radio stations by land or naval forces. Also the Land Warfare Regulations authorize the seizure by a belligerent in occupation of enemy territory of coastal radiotelegraph stations, even if privately owned.

The report of this commission has not been adopted by the participating governments and so cannot be said to be an international agreement. The trend of international thought is, however, clearly shown by the report and belligerents' conduct in future hostilities will probably be along these lines. As has been stated, many of the above articles restate existing agreements which bind the contracting parties.

With regard to Articles 6 and 7, which are of principal interest to a naval commander, it may be assumed that upon occasion the naval commander will consider himself duty bound for the success of his mission to assume control over his theatre of operations in such manner as to insure that the action or presence of other vessels does not jeopardize his mission. Secrecy of movement, and composition of force will always be a necessity in the naval campaign. Yet on the high seas a fleet may be subject to frequent observation by commercial shipping. There can be no question as to a belligerent's right to immediate and effective action to protect his interest against unneutral service by such observers. These articles outline the commission's judgment as to effective action. Undoubtedly they will be a guide to the Powers in writing instructions for the conduct of war, and will be essentially followed unless proved inadequate. It is the writer's opinion that Article 7 offers the greatest safeguard to a fleet commander and that action similar to its provisions will be taken in most cases. Such action is a safeguard against the possibility of unneutral use of such information as might be obtained by observation. It is this safeguard that the fleet commander desires and will maintain.

# The Control of International Radio Communication

By G. Stanley Shoup
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WE hear considerable today about mergers, and as competition increases the tendency in practically all lines appears to be toward that end. The year 1928 was an unusually active one in this respect, probably more so than any preceding year, such fusions running the gamut of virtually all lines of human endeavor. Public utilities, particularly telephone, telegraph, cable and radio companies, have not escaped the fever, as is testified by the recent merger of communications companies in both America and England. It was these combines which set both sides of the Atlantic agog with rumors, and precipitated considerable discussion regarding the probable effect of these mergers upon world communications, and their admitted importance in the control of international communication, both radio and cable.

In many countries, the internal telegraph services are operated as Government monopolies, international services usually being operated by private companies through concessions, although in some cases the Governments also operate and control services extending beyond their frontiers. With the aid of Government subsidies totaling well over $10,000,000 England has dominated the field of submarine cables from their very inception. The United States, on the other hand, has always been averse to Government ownership and operation of communications facilities and to granting them subsidies.

## Development

Although our privately owned cable systems are as well operated as the British, and equally as efficient, they are not as extensive. With the advent of radio, however, the center of influence in world communications has gradually shifted from the Old World to the New. In no country in the world has radio made such remarkable strides as it has in the United States, where in the past five years it has possibly made more progress than other branches of science have attained in twice that span.

The countries dominating the international radio channels of the world today are the United States, England, Germany, and France, with a struggle for supremacy imminent which, according to some writers, may, in its own sphere of action, rival the great struggles for commercial expansion during the mercantilistic era. Long-distance wireless communication is preponderantly in the hands of four companies: the Radio Corporation of America; the Marconi Wireless Telegraph Company, Ltd. (British); the Cie. Generale de Telegraphie Sans Fil (French); and the Gesellschaft fur Drahtlose Telegraphie (German), usually referred to as "Transradio A. G." These companies have formed what is known as the Commercial Radio International Committee, generally known as the "A. E. F. G. Consortium," which provides for the interchange of patents and the allotment of spheres of exploitation. Under this agreement, radio companies have been formed in various countries of South America and stations are now in operation at Rio de Janeiro, São Paulo, Buenos Aires, and Santiago in Chile, with additional sta-

tions soon to be opened in other important Brazilian cities.

The United States has attained an exceptional position in the history of nations. Our total foreign trade has more than doubled since 1913, the figure for that year being $4,277,000,000, while in 1927 it amounted to slightly more than $9,000,000,000. This expansion in overseas trade required a corresponding expansion in the channels for international communications. Adequate and reliable communications facilities are as essential to the conduct of foreign trade as are ships and banks, and if our exporters were to retain the markets gained it was apparent that American communications should be expanded.

Prior to the war, the application of radiotelegraphy had been confined largely to ship-to-shore and shore-to-ship (marine) services, and the stations operating transoceanic commercial services could be literally counted on the fingers of one hand.

Radio, which had been developed into such an important medium of communication under pressure of the exigencies of war, was looked upon as a possible solution for carrying the heavy increase in overseas telegraph traffic. It was a question which deeply concerned certain officials of the American Government, who visualized the great importance and need for a system of overseas radio communication owned and operated by American companies, and which would to a certain extent perhaps offset the dominating influence of Great Britain over submarine cables.

## Overseas Radio Communication

How was this to be accomplished? In 1901 there had been formed the Marconi Wireless Telegraph Company of America, which was really a branch of the British Marconi Company. By 1903 it had opened what was intended to be a transoceanic station at Cape Cod, Massachusetts, and although some traffic was handled it was not powerful enough for work of this nature and was accordingly used for marine service.

The first practical transatlantic commercial radio service was the British circuit opened the latter part of 1907 between Clifdon, Ireland, and Glace Bay, Nova Scotia, the majority of traffic over which consisted of press material destined for a group of New York newspapers. This circuit continued in operation until August, 1909, when fire destroyed the Glace Bay station, but it was rebuilt and service resumed the following year.

The first transatlantic circuit between New Brunswick, New Jersey, and Carnarvon in Wales was almost ready for operation at the outbreak of the war, when all existing stations of the American Marconi Company, as well as those under construction, were placed under the supervision of the United States Navy, and were not returned to the company until February, 1919. American electrical companies and engineers had made notable contributions to the radio art during the war, chief among which was the Alexanderson high-frequency alternator. But at the close of hostilities there was no American organization that could utilize these developments, and since the high-frequency alternator represented a large capital outlay, there loomed the possibility of its being used exclusively by a foreign company.

At this stage there came upon the scene two officials of our Government who had already done much for the cause of radio. They were the late Admiral W. H. G. Bullard, Director of Naval Communications, and Captain S. C. Hooper, present encumbent of

that office. So ably did these gentlemen plead their case before representatives of the General Electric Company on April 5, 1919, that negotiations for the sale of the Alexanderson alternator to foreign interests were cancelled. The opportunity existed for the United States to develop under private enterprise a transoceanic system of radio communication. At the suggestion of Admiral Bullard and Captain Hooper, Owen D. Young took upon himself the responsibility which led to the formation of the Radio Corporation of America in December, 1919. The new company promptly acquired the property and rights of the American Marconi Company and entered into traffic agreements with British, French and German companies.

In March, 1920, the newly formed Radio Corporation of America inaugurated commercial service between New York and London, and by 1921 it had established circuits with Norway, Germany, France, and through Hawaii, with Japan. Additional circuits to other countries increased rapidly, as a consequence of which there are at least as many commercial transoceanic radio services extending from the United States today as radiate from any other country, representing station investments in excess of $20,000,000. We are in daily touch—one might say constantly—by radio with Argentina, Australia, Belgium, Brazil, Canada, Chile, China, Colombia, Cuba, Dutch East Indies, Dutch Guiana, Dutch West Indies, England, France, French Indo-China, Germany, Hawaii, Italy, Liberia, Japan, Netherlands, Norway, Philippines, Poland, Porto Rico, Portugal, Sweden, Turkey, and Venezuela. Additional circuits are projected for communication with Czechoslovakia, Mexico, New Zealand, Russia, South Africa, Spain, Switzerland, and Syria.

### REVOLUTIONIZATION

It was the practical development and consequent application of short-wave transmission and reception that revolutionized the art of long distance radio communication. As early as 1910, the British had considered plans for a chain of radio stations linking the empire, but little had been accomplished. In July, 1924, the British Marconi Company concluded an agreement with the British Post Office for the erection of beam stations for direct communication with the Dominions and India, the rates to be lower than the cable rates, except between England and Canada. By the end of 1927 two-way beam communication was in existence between England and Canada, Australia, South Africa, and India, and during 1928 a circuit was opened between Canada and Australia.

Aided by a schedule of lower rates, the system is now handling in excess of 35,000,000 paid words annually, and has cut heavily into the traffic of the British cable companies. The British cable companies are, of course, privately owned and operated, whereas the beam stations in England are owned and operated by the British Post Office. It was a case of a Government-owned and operated radio system competing not only with the private cable companies, but with the State-owned cables of the Pacific Cable Board and the two Imperial cables across the Atlantic owned and operated by the British Post Office. The result was inevitable. Cable stocks depreciated and the revenues of the cable companies declined. The financial position of the British cable companies, however, with reserves amounting to over £20,000,000, was so strong that they could, had they been so inclined, under-cut any rates the wireless services might establish, but rather than

do that they preferred to go into voluntary liquidation, and so notified His Majesty's Government.

But it was not alone the competition between British radio and cable services that led to the fusion of these interests. Great Britain feared the commanding lead which other countries had assumed in radio and considered it a challenge to British cable supremacy. Then, of course, there was the threat of the cable companies to dispose of their assets, a course which if pursued was fraught with the grave danger of foreign interests gaining control of the British cable system, or at least certain units of that system. In addition, there are many parts of the empire which are not served by radio, and as existing radio services are at times subject to fading, it was desirable that Britain retain control of its cables.

An Imperial Wireless and Cable Conference, composed of representatives of the various Governments of the British Empire, accordingly convened in January, 1928, "To examine the situation which has arisen as a result of the competition of the Beam Wireless with the Cable Services, to report thereon and to make recommendations with a view to a common policy being adopted by the various Governments concerned." Coincident with the meetings of this conference, representatives of the British cable and radio companies conducted negotiations, and on March 15, 1928, the Eastern and associated cable companies and the Marconi Company jointly announced a provisional merger, involving a total capitalization of £53,700,000.

## MERGER

The combine of British cable and radio interests will become effective April 1, 1929, if ratified by Parliament, and there seems to be every indication that the necessary ratification will be forthcoming. From the merger company there will be formed a communications company with a capital not to exceed £30,000,000 at its inception. The formation of this company is made necessary by reason of the fact that both the cable and radio groups have large investments and manufacturing interests not directly concerned with communication activities, and the sole function of the communications company, therefore, will be the operation of communication services. The salient points of this fusion may be summed up as follows:

The communications company will acquire the two imperial cables across the Atlantic, now operated by the British Post Office—at a deficit; the cables of the Pacific Cable Board connecting Canada with New Zealand and Australia, a route which when linked with the two Atlantic cables mentioned above and Canadian land lines, provides an all-British system, no part of which passes through foreign territory; the West Indian cable and wireless system, operated by the Pacific Cable Board; and the lease for 25 years of the profitable beam radio circuits of the Post Office, at an annual rental of £250,000 in addition to other monetary considerations.

A standard net revenue of £1,865,000, exclusive of non-telegraphic investment revenue, will be fixed to the purposes of the communications company. Half of any excess revenue will go to the communications company and the other half will be devoted to reduction of rates. The board of directors of the merger company, the communications company, and the cable and Marconi companies will be the same, two of whom shall be approved by the Government. Provision is made for an Advisory Committee, composed of representatives of the Governments who were parties to the Wireless and

Cable Conference. This committee shall be consulted by the communications company about all questions of policy, including any alteration in rates.

It is agreed that British control must be guaranteed; that the Governments may assume control of the cable and wireless systems during national emergencies; and that the army and navy are entitled to construct and operate cable and wireless stations for their own needs, but not for commercial purposes. The British Post Office may reserve the right to operate the external telephone services from Great Britain, but must agree with the communications company upon terms for utilizing company radio stations for telephone transmission and reception.

Thus it will be seen that this combine or regulated monopoly will give a rapid, efficient and cheap telegraphic service to the British Empire, with the public adequately protected by an Advisory Committee. It insures the maintenance of both cable and radio communication, and, most important of all from the standpoint of international communications, it will eliminate competition within the empire and provide a unified system for competing with foreign companies, and may conceivably result in a reduction of rates.

### AMERICAN SYSTEM

What is the position of American communications in contrast with the new alignment soon to take effect in Britain, and how can the United States maintain its leadership in international communications? Within the past few years, through the medium of the International Telephone and Telegraph Corporation and the American Telephone and Telegraph Company, the United States has become the acknowledged leader in the field of international telephony. In the case of transatlantic telephony, for example, development work has been in progress by the latter company for nearly 15 years, resulting in the opening of commercial service in January, 1927. The former company, which was organized in 1920, with its cable, telegraph, wireless, telephone and manufacturing plants, connects, operates or manufactures in virtually all countries in the world. During 1927 the company expanded tremendously and the consolidated net income of the system more than doubled that of 1926, the consolidated plant and property account increasing from $53,000,000 to $99,000,000.

The acquisition of telephone companies in Brazil, Chile, Argentina and Uruguay presaged in intensive development of telephone systems in South America, and was the forerunner of international telephone service between Argentina, Chile, and Uruguay, which together with other achievements, such as the establishment of telephone service from Cuba and Mexico to the United States and Canada, has clearly established American telephone supremacy south of the Rio Grande. Through a Spanish subsidiary, a modern telephone plant has been installed throughout Spain, which in October, 1928, was linked with the transatlantic radiotelephone. Associated manufacturing plants of the corporation are located in Antwerp, Peking, Buenos Aires, Paris, Tokyo, Oslo, Madrid, Milan, London, Sydney, Budapest, and Vienna. Their position was immeasurably strengthened in April, 1927, when All America Cables, Inc., with its 27,000 miles of cables and landlines serving Central and South America, merged with the International System.

America partially met the British fusion of radio and cable interests when in March, 1928, the country was startled by the announcement that the International System had merged with the Mackay interests, which includes

ownership or operation of over 36,000 miles of cables connecting principally the United States with Europe and the Far East; the Postal Telegraph system serving the United States; and the Mackay Radio and Telegraph Company which owns and operates a radiotelegraph service on the West Coast and intends to establish international radio communication with Europe and the Far East.

The guiding spirit of American ingenuity made possible the transatlantic radiotelephone that now links the United States, Canada, Cuba, and Mexico, with many European countries. This service is established between the system of the American Telephone and Telegraph Company in this country and the system of the British General Post Office in England. Extensions from both terminals are made over the regular long-distance telephone circuits through the coöperation of the respective telephone administratons of the countries through which the circuits extend. The International Telephone and Telegraph Corporation has cooperated in the extension of the service to Cuba and Mexico on the American side and to Spain on the European side.

It is well to bear in mind that these two American companies, the American Telephone and Telegraph Company and the International Telephone and Telegraph Corporation, are separate and distinct entities; the former being concerned with telephone systems in the United States, including the establishment of foreign connections, while the latter is engaged in the operation of telephone properties in other countries and in the establishment of international communication connections rather generally, including both cable telegraphy and radio circuits. Both companies are keenly interested in the development of international radiotelephone facilities. The International Corporation has acquired a site near Paris where a large group of engineers are devoting their entire time to experimental work in radio. With the stations and experimental laboratories of the Mackay Radio Company available, obtained when that company absorbed the Federal Telegraph Company of California, as well as the former Navy station at Sayville, L. I., as a nucleus, coupled with its extensive manufacturing plants abroad, it is only reasonable to assume that the International System will make a substantial contribution to the radio art, particularly in its international application.

The United States has the most efficient and highly developed telephone system of any nation in the world, due in large measure to the benefits derived from unified and intelligent administration. In pondering this fact, it might be well to pause for a moment and reflect what this telephone service would be were it to consist of countless independent companies, each serving relatively small areas, with little or no coördination between them. In fact, the history of communications in the United States is filled with instances of small and poorly organized companies which, for various reasons were unable to survive, and either expired or were acquired by others.

Sentiment in the United States has always held that there must be competition, a policy that was affirmed in the Radio Act of 1927. Many now question whether this element of competition should remain and be made applicable to our system of international communications, especially in the light of present day developments in other countries.

### FUTURE EXPANSION

Disregarding the United States and Great Britain for the moment, we find that virtually all countries of commer-

cial importance are endeavoring to effect direct radio communication with other countries. Germany and France have long had well-developed systems of radio communication now utilized for commercial work and being extended wherever possible. Communication developments in the United States and Great Britain are being followed with interest, and it should not cause much surprise, therefore, if other countries should elect to combine their international radio and cable services, at present operated by private enterprise through concessions.

With these facts in mind, it is hardly probable that American companies will undertake an extensive program of cable expansion that would result in a parity with the cable mileage of Great Britain. On the the other hand, there is every evidence that American cable companies will expand their systems. New cables will be laid, and as older ones become obsolete they will be replaced by cables of the most improved type, assuming such replacements to be justified. In 1924 the Western Union laid the first permalloy cable to the Azores, providing direct service to Italy and Germany, as well as giving American cable users a far better outlet to Spain and South Africa. A new permalloy cable was laid between the United States and Great Britain in 1926, and only within the past few months the Western Union completed the laying of 1,341 nautical miles of the most improved type of cable between Newfoundland and the Azores, at a cost of approximately $1,800,000. From the foregoing it is apparent that cables have not become passé; in fact it is said that radio will not entirely supplant the submarine cable.

### SHORT WAVES

The success attained in the use of short waves, however, has revolutionized long range wireless communication to such an extent that radio is now in a position where it can compete and is seriously competing with cables, as a competitor of which it has greatly stimulated the volume of international telegraphic correspondence. This is evident when it is realized that the total radio traffic from and to the United States amounted to 38,000,000 paid words in 1927, as compared with only 7,000,000 in 1920, cable correspondence showing proportionate increase. Short-wave transmission in its present state of development, is subject to periods of fading; however, as it becomes constantly perfected and increasingly reliable it seems destined to be a still greater force in world communications.

The rapidity with which the nations of the world are allocating short waves is a barometer of the growing importance attached to this method of communication. So rapid is the radio art moving that no one can prophesy what the future of radio communication will be.

Professor Michael I. Pupin, of Columbia University, one of America's foremost inventors in the electrical field and inventor of the Pupin loading coil which made long-distance telephony possible, in discussing the relation between cable and wireless communication, is quoted as follows by the *New York Times* of February 19, 1928:

> Competition is a splendid thing, but if the two competing methods of communication are used in a way to wreck one another, that competition would be a bad thing. Why should two individuals whose virtues supplement each other be enemies? The two methods of communication are natural friends and should act in concert. Coöperation between wireless and wires will be advocated by every sensible man. The best engineers in Europe recognize the limitations of each method and recognize also that these limitations practically dis-

appear when they are made to supplement one another.

It is well to remember that the initial cost of a transoceanic cable is high when compared with the initial cost of a radio link. This is particularly true now that short wave beam and projector systems are available. Furthermore, the annual operating costs of a radio station are also somewhat less than those of a modern submarine cable. According to some authorities, however, a purely economic comparison of the relative costs of radio and cable systems is not conclusive because of the lesser reliability of radio circuits. It does seem clear, however, that for circuits required on some routes, considerations of economy will require the use of radio for a substantial proportion of the total facilities.

### COÖPERATION AND CONSOLIDATION

Many believe that Congress may remove certain features of the present radio law and enact legislation permitting the merging of our wire and radio companies into one great consolidation, in which the public would be protected by probably both Government representation and regulation. particularly in the matter of rates.

Only recently statements appeared in the press to the effect that officials of the Western Union and Radio Corporation were negotiating for a merger of the two companies. If this occurs, upon passage of necessary legislation permitting it, our international and domestic communications activities, excepting, of course, domestic telephones, will revolve around two large companies and thus retain that element of competition which would call for only a minimum of Government regulation. By coöperation they should be in a position to meet the competition which they will undoubtedly have to face from like interests abroad.

On the other hand, there are those who believe, particularly with reference to international communications, that existing cable and radio companies in the United States should all be consolidated into one organization under Government regulation, on the theory that if there are several companies in this country with which a foreign communications company has to deal it will thus be in a position to play competing American companies against each other, whereas if our communications activities were concentrated under one company a situation of that nature would not exist. Proponents of a unified system claim that it will substantially reduce overhead and operating costs, the benefits of which may be passed along to the public in the form of cheaper rates. They contend that although competition does result in a higher quality of service, in that each company constantly strives to surpass every other company, it has little or no effect upon tariffs. In other words, rates being equal, communication companies are competing solely on the basis of service, but under a regulated monopoly it is said that rates could be substantially reduced.

The conception of a perfect system of modern communications is a radio and cable network so coördinated that if transmission difficulties occur in one method traffic can be immediately routed by the other with no delay. Each perform services for which the other is unsuited and there should be close coöperation between them.

As pointed out earlier, our foreign trade has reached enormous proportions. With the economic recovery of Europe, its increased production and purchasing power, it appears that the next few years will witness unusually keen rivalry in foreign commerce; therefore, it is essential that our com-

munications system, which are the very nerves of trade, be fortified to meet this situation.

In an address delivered before the students of the Harvard Business School on April 23, 1928, General James G. Harbord, President of the Radio Corporation of America, made the following pertinent statement:

> During its 150 years of existence, the United States has never had but one consistently maintained foreign policy, namely, the Monroe Doctrine. Great Britain, on the other hand, in more than a thousand years has probably had more than a thousand such policies. The British system of government seems far better adapted to a continuity of foreign policy than our own, which is not saying that our own system is not the best in many other respects.

In discussing the unification of cable and radio interests in Great Britain, General Harbord said:

> The American answer to this challenge can only be made by submitting the great communication companies, both cable and radio, to proper government regulation as to rates while exempting them from the operation of the anti-trust laws and permitting unification here and thus meeting the thrust of unification from abroad.

In this connection, it is interesting to note an article that appeared in a leading London journal:

> America, the journal declares, referring to what it terms "a bold and magnificent policy, . . . has now carried out, through its commercial cable and wireless corporations, far-reaching schemes for direct cable and wireless communication with every country in Europe, with Japan, and with the whole of the Far East. The American Government have had the wisdom, of course, to realize that, acting as a Government, they would have no chance of acquiring any position in the communication systems of other countries; but, acting through their financial and commercial organizations . . . they already have acquired a dominating position, and are steadily increasing its strength. The field of international communications is one in which it is hopeless for disorganized units . . . to compete against powerful combinations under unified direction, and having at their disposal capital resources of fabulous amount and the best technical equipment in the world.

Apropos of the question of international competition, and more particularly from the angle of an impending international "communication war," there probably has been somewhat of a tendency towards exaggeration. There are many acreas throughout the world which still offer a fertile field for the improvement and development of communication facilities. The extension of services by a foreign company to the Far East, for instance, is likewise valuable to the American business man, because the development of cable or radio traffic in the sphere of one communication company adds to the business handled by other companies which interchange traffic with it without regard to the nationality or ownership of the companies interchanging traffic. There is no disputing the fact that competition does exist on certain routes, but as there develops greater intensification of industry and commerce, together with improved transportation and communication facilities, it follows that there will be a resultant increase in the volume of cable and radio correspondence, and there seems to be no reason why cable and radio companies should not look forward to greater traffic in the future.

Aside from the material aspects of a coördinated or unified extensive system of communications befitting a nation of our prestige in international affairs, there is the all important consideration of national defense. The average citizen has no conception of the utility of radio to the military services. The need for an all American system of

communications was never more apparent than upon our entry into the war. As the conflict progressed, the situation became more acute, but was later alleviated to some extent by the erection of the Bordeaux station and the development of other facilities by the Navy. And there is still another reason. News follows trade, and as the flow of news increases in proportion to trade expansion, we lay the foundations for that breadth of understanding and goodwill which electrical communication so ably engenders.

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